# School Shop

vol. XVIII no. 6
FEBRUARY 1959

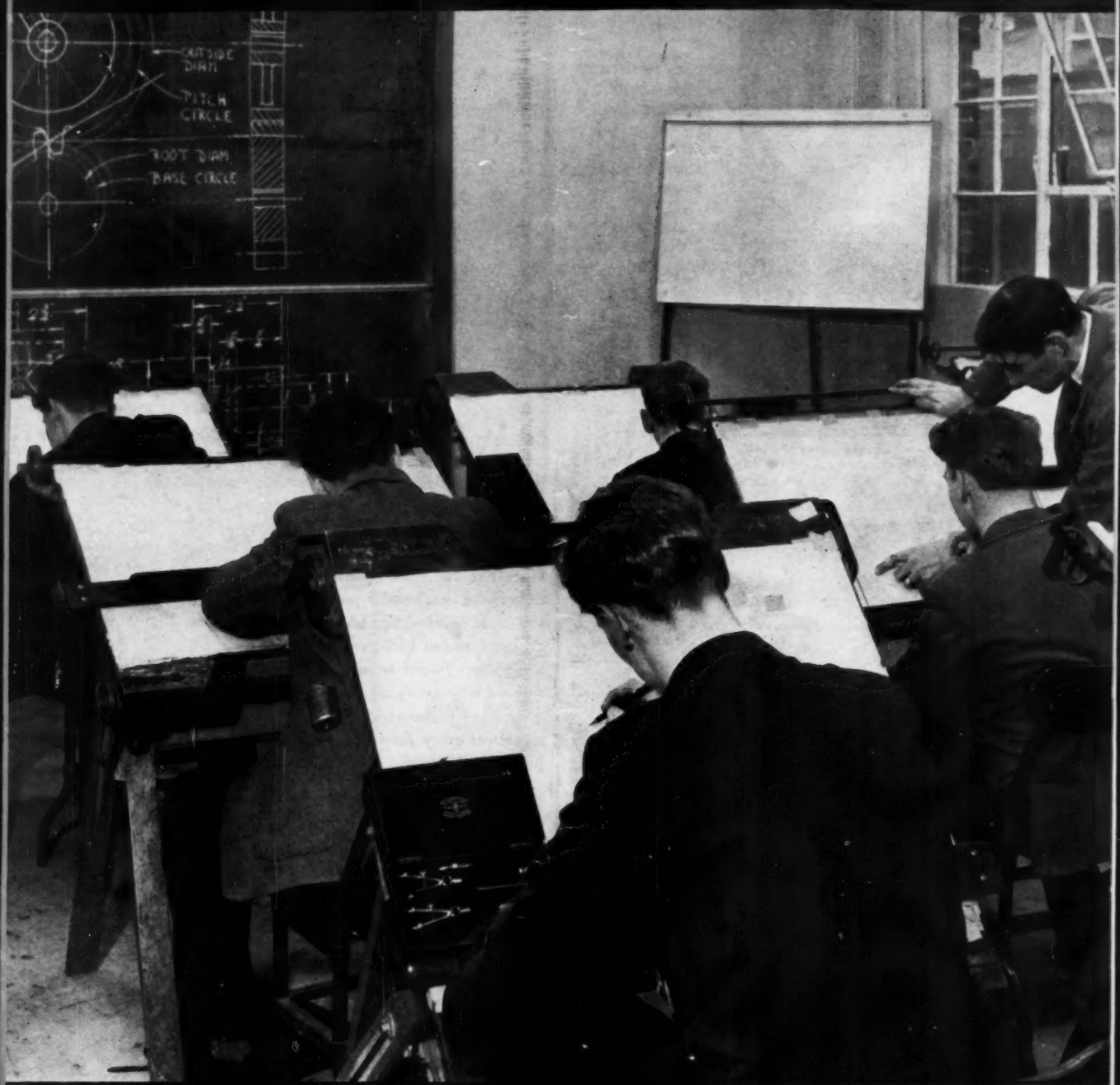
**How You Can Help Your Supplier**
by Thomas Diamond

**Production Molding Patterns**
by H. P. Gerber and H. J. Gerber

**"Jeans" Meet Pig Tails**
by Calvin H. Dimm

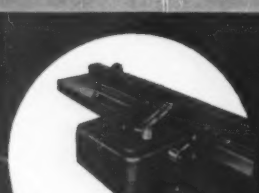
**Compound Miters**
by Donald B. McKay

Cover Story: Drafting students at the Vauxhall Motors Educational Training Center in Luton, England. For ideas on teaching drafting, see story on page 16.

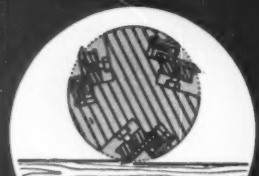



THE MAGAZINE FOR TEACHERS OF INDUSTRIAL EDUCATION

# POWERMATIC FEATURES ASSURE UNEXCELLED PERFORMANCE



Handy levers lock fence in any desired position.



Cutterhead jackscrews assure quick, easy knife adjustment.

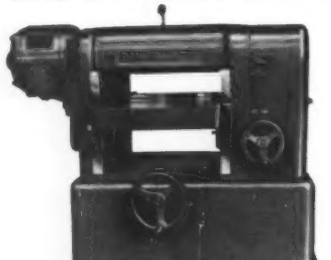
Cutterhead guard swings away for rabbeting operations.

- CAST IRON OR STEEL—NOTHING DIE-CAST
- BUILT-IN DUST CHUTE IN FLOOR STAND
- TABLES FULLY ADJUSTABLE FOR ACCURACY

**Model 60**
**8" Jointer**

Pick your problem . . . then solve it quickly with this long-bed, production type jointer! Watch it handle every job with keen accuracy and precision . . . put it to tough use for *years!* Full 64" bed is machined from finest grey iron castings. Rigid center-mounted fence tilts 45° right or left. Cutterhead machined from carbon tool steel, dynamically balanced, on large sealed ball bearings . . . 3 high-speed steel knives secured with safety shims. True unexcelled performance . . . to answer every shop and plant requirement!

## 160-D 16" PLANER . . . ONE OF MANY SIZES



Only planer in the field offering Powermatic's exclusive Quik-Set® Table Roll Adjustment (optional).

Simple lever adjusts table 0 to .040" instantly! Heavy cast iron frame on 26 x 30" base. 3-knife cutterhead of carbon steel.

**POWERMATIC**
**MACHINE COMPANY**
**McMinnville • Tennessee**

**MAIL COUPON TODAY FOR FULL DETAILS**

POWERMATIC MACHINE COMPANY McMinnville, Tennessee
Dept. 7

Please rush me full details on the Powermatic

☐ 12, 16, 20 & 24" PLANERS ☐ DRILL PRESSES ☐ JOINTERS
☐ CHAIN & HOLLOW-CHISEL MORTISERS ☐ TENONERS
☐ ARBOR & BAND SAWS

Name.....

Address.....

City & State.....

A
HELPF
Servic
for Yo

Here is a sure, way to obtain plete product mation from th vertisers in this of School Sho

Use the po free inquiry co the back of th sue.

1. Consult In Advertisers.

2. Circle the responding nu provided on the in the back o issue for con product inform

3. Tear out mail the postag card to School now!

# School Shop

THE MAGAZINE FOR TEACHERS OF INDUSTRIAL EDUCATION

**Editor and Publisher**
Lawrence W. Prakken

**Chairman, Editorial Board**
Thomas Diamond

**Associate Editor**
Jerome C. Patterson

**Assistant Editor**
Oliver E. Hanninen

**Advertising Production Manager**
Dorothy J. Buffington

**Circulation Manager**
Barbara N. Leake

•

**EDITORIAL ADVISORY BOARD**

W. M. Arnold, Director, Kansas State Department of Vocational Education, Topeka.

Dewey F. Barich, President, Detroit Institute of Technology, Detroit, Michigan.

Russell K. Britton, Administrative Director, Division of Instructional Services, Denver, Colorado, Public Schools.

J. Lyman Goldsmith, Supervisor, Agricultural-Vocational-Industrial Arts, Public Schools, Los Angeles, California.

L. Lawton Gore, Professor of Industrial Education, George Peabody College for Teachers, Nashville, Tennessee.

M. Ray Karnes, Chairman, Department of Industrial Education, University of Illinois, Urbana.

E. L. Kurth, Consultant for Industrial Arts, Florida State Department of Education, Tallahassee.

S. Lewis Land, Head, Department of Industrial Education, The Pennsylvania State University, University Park.

William J. Micheels, Professor and Chairman, Department of Industrial Education, University of Minnesota, Minneapolis.

George W. Morgenroth, Director, Essex County Vocational Schools, Newark, New Jersey.

Emmett O'Brien, Director, Division of Vocational Services, Connecticut State Department of Education, Hartford.

John P. Walsh, Director, Trade and Industrial Education Branch, U.S. Office of Education, Washington, D.C.

•

**MEMBER OF**

EDUCATIONAL PRESS ASSOCIATION OF AMERICA

**Vol. XVIII, No. 6** **February 1959**

## CONTENTS

**How You Can Help Your Supplier**.....Thomas Diamond 9
From SCHOOL SHOP's doughty Scot come some hints on getting lower prices (he should know) and better service.

**Production Molding Patterns**.....H. P. Gerber and H. J. Gerber 10
Father and son team-up in this article describing a technique they have used to mass produce 8" woodworking lathes.

**"Jeans" Meet Pig Tails in Shop and Home Arts** Calvin H. Dimm 13
This is a story about "equal rights"—for boys and girls—in the shop.

**Compound Miters Can Be a Cinch**.....Donald B. McKay 14
If it is a way of relating trigonometry to woodwork you are looking for, turn to page 14 **pronto!**

**Sheetmetal Drawing**.....Richard W. Shackelford 16
An interesting approach toward generating interest in a sticky problem.

**Magazine Rack with a Modern Touch**.....Rudy Albert 17
A neat and tidy take-home project that stresses design.

**Add Etched Circuits to Your Electricity Program**
.....C. B. Porter and Tod H. Herring 18
A detailed description of the techniques used widely in industry.

**300 Spun Aluminum Bowls**..... 20
For your next open house, consider aluminum bowls as souvenirs for your guests.

**Industrial Arts and Social Studies**
.....Romolo Nardi, Jr., and Raymond Teitelman 22
A story about integration.

**Basket Weaving**.....Alvin R. Lappin 26
It's an ancient art, but one which allows students to experiment with use of materials and design.

**Fishing Lures**.....Bob Reeves 38
It's close to that time of year.

**Join the "Design in the Shop" Program**..... 42
Welcome!

**REGULAR FEATURES**

**School Shop Talk**..... 2
No More White Elephants!

**In the Morning Mail**..... 4
Comments from readers.

**Strictly Personal**..... 24
About your fellow teachers.

**News**..... 28
Happenings in industrial education.

**Diamond Dust**.....Thomas Diamond 32
Willie Watches Out!

**School Shop Kinks**..... 35
Shortcuts for doing shopwork.

**Here Is a Way**..... 37
How to publicize your program.

**Instructional Resources**..... 44
The latest in books, pamphlets, and audio visuals.

**News from Industry**..... 48
New products and teaching aids. Send in a card today.

**From Washington**.....Michael Paca 60
News from the Nation's Capital.

**Index to Advertisers**..... 60
Check the numbers on the card for more information from advertisers.

EPA

**Editorial and Business Office:** 330 Thompson Street, Ann Arbor, Michigan.

**Manuscript Information:** Manuscripts are paid for at regular space rates and should be addressed to the Editor, School Shop, 330 Thompson Street, Ann Arbor, Michigan.

**Subscription Rates:** $3.00 a year; Canadian, $3.00 a year; foreign, $4.00 a year. Single copies, 40 cents each except April which is 80 cents. Special group rates for students in teacher-training institutions will be given on application.

**Publication Information:** Published monthly, September through June at Mount Morris, Illinois. Printed in the United States of America. **Copyright 1959 by Lawrence W. Prakken.**

**Advertising Sales Offices:**
Chicago 4, Illinois—R. L. (Les) Gray, Western Manager, 53 West Jackson Blvd., Suite 760, telephone HArrison 7-9689.
New York 17, N. Y.—Macintyre-Simpson & Woods, 101 Park Ave., telephone LExington 2-0020.
Ann Arbor, Mich.—330 Thompson Street, telephone NOrmandy 8-7205.
Los Angeles, Calif.—The Jess M. Laughlin Company, 3757 Wilshire Blvd., Suite 701, telephone DUnkirk 3-7697.
San Francisco 4, Calif.—The Jess M. Laughlin Company, 465 California, telephone EXbrook 2-9060.

**Postal Information:** Accepted as controlled circulation publication at Mount Morris, Illinois, and Ann Arbor, Michigan.

AMERICAN TECH
Publishers since 1898...

*Thoughtful shop teachers know that there aren't many industrial subjects for which it can't be said*

**THERE'S OFTEN A BETTER WAY!!**

*Practically the entire profession agrees, for instance, that today's* BETTER WAY *to teach print-reading can be found in American Tech's enormously popular 3rd Edition of*

**Building Trades Blueprint Reading, PART I—FUNDAMENTALS**
Dalzell-Battenberg-Paul $2.75

*Now, in response to hundreds of requests, American Tech has also incorporated this* BETTER WAY *into*

**Building Trades Blueprint Reading Part II**

(Sundberg-Paul $2.95)

*Some features you will like —*

- the product of an exhaustive examination of current building trades curricula.
- covers new materials, new types of specification, important changes in contemporary design.
- can be used as a basic text, as supplementary material, or to meet training needs unique to your particular program.
- includes 88 pages, plus 8 full-sized prints, dozens of illustrations, a glossary of terms, and an appendix of important trade symbols, tables, and abbreviations.

**Wire-O-bound in paper covers.**

Send for on approval copies

**American Technical Society**
Dept. W353
848 E. 58th St., Chicago 37, Ill.

Please send me on approval copies of books checked below. After as long as 30 days of leisurely examination, I agree to either return them, or make remittance—less educators' discount.

☐ Building Trades Blueprint Reading, Part I.
☐ Building Trades Blueprint Reading, Part II.

Name .....
Subject/Position .....
School .....
Address .....
City..... Zone.... State.....

# School Shop TALK

## COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

### No More White Elephants!

More than once recently it has been our happy experience to encounter shopmen who vowed to pass up any more "white elephants." One pointed to a nine-year-old beat-up Chevy which had been "given" to the school by the president of the board of education. Space was at a premium in the auto shop. The car had none of the attributes of a modern automobile that are needed for modern auto mechanics training. Yet he felt constrained to keep it on hand because the board president would feel hurt if he wandered into the shop and did not see his munificent gift.

This is typical of many of the gifts which come from individuals, local industry, and sometimes government surplus.

Another school shop I recently visited had enough of a special type of steel to keep its machine-shop classes going until 1968. The stuff had been deposited at the school by a local plant when it was cleaning out some of its steel warehouse items. The steel was usable in the machine shop but only for certain kinds of work and in a much smaller quantity than the school was stuck with. The abnormal quantity was using up valuable storage space, to say nothing of giving the school administration the false notion that it would not have to buy any steel for the shop for some time to come.

Interest in the shop program by local industry and individuals is all to the good, of course. Far be it for us to want to alienate friends of the public schools. The problem arises, however, in the general attitude that the indiscriminate acceptance of handouts creates in the minds of the public and of the school administration.

If the attitude in the community is that the schools are a charitable institution, rather than an important public agency charged with the responsibility of educating the youth of the community to the best of its ability, then the feeling of full community responsibility for the proper support of its own public schools is lost.

When tools, equipment, or supplies are needed they should be supplied for the shop program from the same sources that any other public or private agency would procure them. They also should be purchased carefully to proper specifications to aid in the educational process for which they are intended. Quantities and quality should be carefully controlled and the material should be purchased because it is essential for the proper functioning of the shop program.

When indiscriminate gifts are solicited or accepted, the educational program is frequently thrown out of focus and the schools are made to appear as paupers seeking handouts or as objects of charity accepting the largesse of individuals or groups who sometimes mistakenly believe they have thus met their obligation to the schools.

Moreover, unthinking school administrators often cut the appropriation for needed materials because they mistakenly think that the acquisition by the industrial-education department of some white elephant will take care of its needs or that the department can go to some source in the community and beg for cast-offs that will fill its needs.

We are not opposed to the acceptance of gifts that have real use in the school shops and will fit into the educational program. Many individuals and firms have been thoughtfully helpful in supplying instructional materials and other items that make industrial education more meaningful for students and that would not ordinarily be purchased by the school system.

Our quarrel is with the white elephants that can be seen so often in shops and with the attitude that the school system cannot be responsible for supplying what is actually essential for a well-taught program.

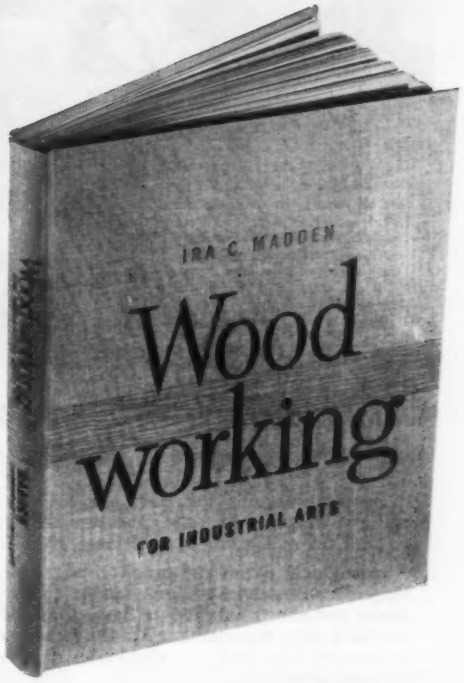
The gift problem can be solved, first, by setting up a policy within the school system for the acceptance of gifts and for the solicitation of them by shop teachers. This policy should be in writing and approved by the board of education and the school administration. Second, shop teachers can make a sound educational case to the school administration for having proper and sufficient equipment and supplies so that panhandling will not be necessary.

We are all for gifts that fill a need and would not ordinarily be available through standard requisitioning channels, but we also think it's time to call a halt on white elephants.—*L. W. P.*

# GOODHEART WILLCOX PRACTICAL BOOKS

## LOTS OF "SHOW-HOW" *for* SCHOOL-SHOPS · EASY TO USE !

### Check Books You Would Like to Examine, and MAIL TODAY!




☐ **WOODWORKING FOR INDUSTRIAL ARTS.** By Ira C. Madden. Supplies basic knowledge about tools, woods, and finishing materials, used in productive shop work. Provides a wide selection of project materials of proven student interest in the form of detailed drawings and photos; also design suggestions and variations. Guides and helps students create in their own way. An outstanding text to be used by students of all ages, and teachers, to improve instruction in this important field. Replaces Creative Handicraft in Goodheart-Willcox line. $4.00.

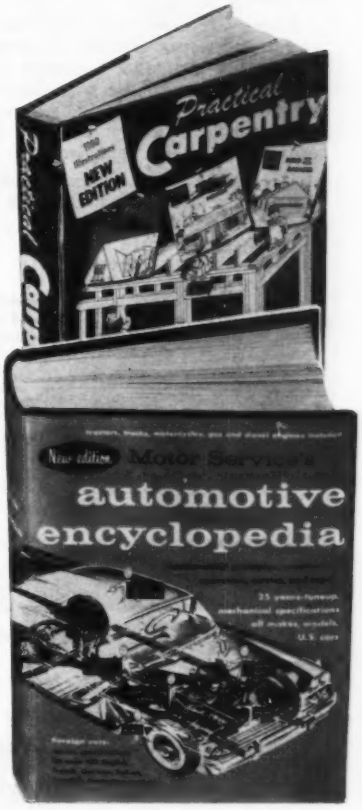
☐ **MOTOR SERVICE'S AUTOMOTIVE ENCYCLOPEDIA.** By Toboldt & Purvis. Greatest book available for teaching students Fundamental Principles and Basic Service Procedures—the foundation on which a sound, thorough knowledge of auto mechanics is based. Used by over 700 schools. $7.95.

☐ **AUTOMOTIVE ENCYCLOPEDIA STUDY GUIDE.** Teaching aid for Schools using Motor Service's Encyclopedia. Study Guide Sheets per set $2.00.

☐ **PRACTICAL CARPENTRY.** By Mix & Cirou. Used by more than 1050 schools! Places special emphasis on proper techniques so beginner will understand and become acquainted with best carpentry practices, and use of modern materials. New insert in four colors shows how to identify 32 different woods. Over 1100 illustrations. $5.00.

☐ **MODERN REFRIGERATION & AIR CONDITIONING.** By Althouse & Turnquist. Gives students sound foundation in Air Conditioning and Refrigeration Principles, and acquaints them with refrigerating mechanisms and their components. Covers application of refrigeration in all its branches—Domestic, Commercial; Residential, Car Air Conditioning, Heat Pumps, etc. $7.45.

☐ **MODERN WELDING PRACTICE.** By Althouse & Turnquist. Latest information on welding, metal cutting, heat treating, in non-technical form. Unbiased coverage of entire welding field in one book. Especially recommended as text for beginners. $5.00.




☐ Goodheart-Willcox's new **PAINTING & DECORATING ENCYCLOPEDIA.** By Wm. Don Jarvis. Complete library of up-to-date "know-how" on modern painting, decorating and wood finishing, in one easy-to-use volume. Prepared especially for use by apprentices, vocational students. $5.45.

☐ **COPE'S PLASTICS BOOK.** By D. W. Cope. Photos and step-by-step constructional details on more than 90 useful and colorful projects. Best ways to saw, machine, polish, form, cement, clean plastics. Special section on internal carving. $4.50.

☐ **ALL ABOUT SMALL GAS ENGINES.** By Jud Purvis. New field which offers lots of possibilities. Non-technical information on small two, four-cycle engines. $4.50.

☐ **AUTOMATIC TRANSMISSIONS SIMPLIFIED.** By Jud Purvis. Carefully explains transmission fundamentals, tells and shows how transmissions work; how to service and repair them. $5.45.

☐ **FIX YOUR FORD** ..... $2.95
☐ **FIX YOUR CHEVROLET** ..... 2.95
☐ **FIX YOUR PLYMOUTH** ..... 2.95
☐ **103 EASY JIG SAW PROJECTS** ..... 1.50
☐ **72 BIRD HOUSES & FEEDERS** You Can Make ..... 1.50
☐ **PROJECTS FOR METALS,** by John R. Walker. 43 new projects ..... 1.75
☐ **VOCATIONAL MATHEMATICS** (Shop Arithmetic) ..... 1.50
☐ **VOCATIONAL MATHEMATICS** (Shop Geometry, Algebra, Trigonometry) ..... 1.75
☐ **PLUMBING & PIPEFITTING LAYOUT JOB SHEETS** ..... 2.95

**GOODHEART-WILLCOX CO.**
**1322 S. Wabash, Dept. 54, Chicago 5**

Please send me on 30 days approval books checked above. (20% Discount to Schools and Teachers).

Name .....

Street .....

City ..... Zone ..... State .....

*Publishers of Topnotch Texts Since 1921*

**HERE'S PROOF OF PERFORMANCE:**
*"My eight Clausing 6328 Lathes are the finest lathes for instructional use I have ever seen. Their safety features, ruggedness and ease of operation make them tops in their field. They offer so many more features than any other lathe that I would vote for a Clausing every time."*
Harold Burgan, Spokane, Washington

## CLAUSING 6300-series 12¾" LATHES

### are "TOPS for safety . . . ruggedness . . . ease of operation"

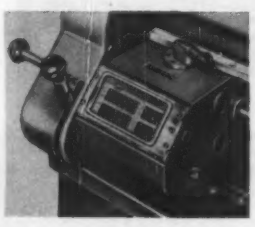
Harold Burgan's statement above is typical. Instructors everywhere report Clausing Lathes set the standard for safety, rugged construction, ease of operation and Value! Here are a few reasons why:

Headstock, apron and quick-change are *totally enclosed* . . . inquiring fingers can't get into these danger zones, nor can dirt or chips . . . all gears and shafts travel in a bath of oil. All controls . . . including those for back gear engagement . . . are located outside machine. Spindle nose is tapered Key-lock . . . eliminates danger of chuck run-off on braking or reversing.

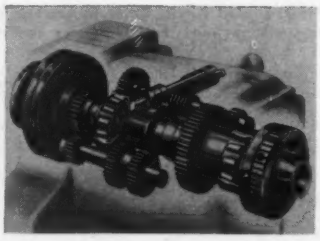
Flame hardened bed ways for longer wear are standard equipment *at no extra cost.* Spindle is forged steel, turns on Timken "Zero-Precision" tapered roller bearings. Apron and quick-change gears are protected by safety devices . . . lead screw has easy-to-replace shear pin.

Drive is underneath . . . no exposed belts or pulleys. Has heavy-duty ball bearing countershaft. Two V-belts drive the spindle . . . belts are outboard for easy replacement.

Get the facts and compare with any other lathe in its class . . . feature for feature, dollar for dollar. We know you'll agree Clausing 6300-series are today's outstanding values . . . *the* lathes for *your* shop. Write for illustrated literature today.



Quick-change box, too, is totally enclosed and gears and shafts turn in bath of oil . . . another important safety and long-service-life feature exclusive with Clausing in lathes of its class.



Enclosed construction of headstock provides greater rigidity, safety . . . longer service life. All gears, shafts and bearings travel in a pumped bath of oil.

**CONDENSED SPECIFICATIONS**

| | |
|---|---|
| Swing over bed | 12¾" |
| Between centers | 21½", 33½", 47" |
| Hole thru spindle | 1⅜" |
| Thread range | 54 selections, 4 to 224 Standard right or left |
| Motor recommended | 1 or 1½ HP, 1 or 2 speed |

**CLAUSING** **CLAUSING DIVISION**
ATLAS PRESS COMPANY
2-122 N. PITCHER ST. • KALAMAZOO, MICH.


# IN THE *Morning Mail* . .

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Sir,

We think SCHOOL SHOP is a wonderful magazine because of the shop kinks, the projects, the stories, and the "Diamond Dust"—written by a man whom I have met a number of times and have always admired.

SCHOOL SHOP, along with *Steel Facts, Chips, M.I.E.A. Bulletin,* and *Missouri Schools,* is in a conspicuous place in our shop where all can see and read at their leisure, as you can see from the photograph (below).

Our shop is set up with 15 stations, each with a bench, vise, and the necessary hand

tools for general layout work. This means each student has his own individual bench and tools. Our machinery is as follows: Two Regal, one South Bend 13", two 12" Clausing, and two 9" South Bend lathes; a Grobe band saw; an 18" drill press; a 12" Van Norman miller; a Clausing vertical mill; a 16" shaper and a 7" shaper; a Delta surface grinder; a K. O. Lee tool grinder; and a Racine power hack saw. The shop is well lighted and ventilated.

*William Helm,*
Fulton High School,
Fulton, Mo.

Dear Sir,

I wish to commend you on the two articles on page 2 of the December, 1958, issue of SCHOOL SHOP. ("Are You Missing a Bet?" and "What about Projects?") You and your publications, I feel, are contributing a great deal to the industrial-arts profession. SCHOOL SHOP, I am quite sure, is one of the best read professional publications by industrial-arts educators.

*E. W. Tischendorf,*
Head, Industrial-Arts Dept.,
Kent State University, Ohio.

Dear Sir,

Please include the following persons on your circulation list for Redmond Union High School, Oregon. . . . I would personally like to thank you for the tremendous amount of inspiration and guidance that has come to me from the pages of SCHOOL SHOP during the past nine years. I am sure that SCHOOL SHOP has done the same for thousands of other shop teachers and will continue to do so.

*Charles H. Ward,*
Redmond Union High School,
Redmond, Ore.

Dear Sir,

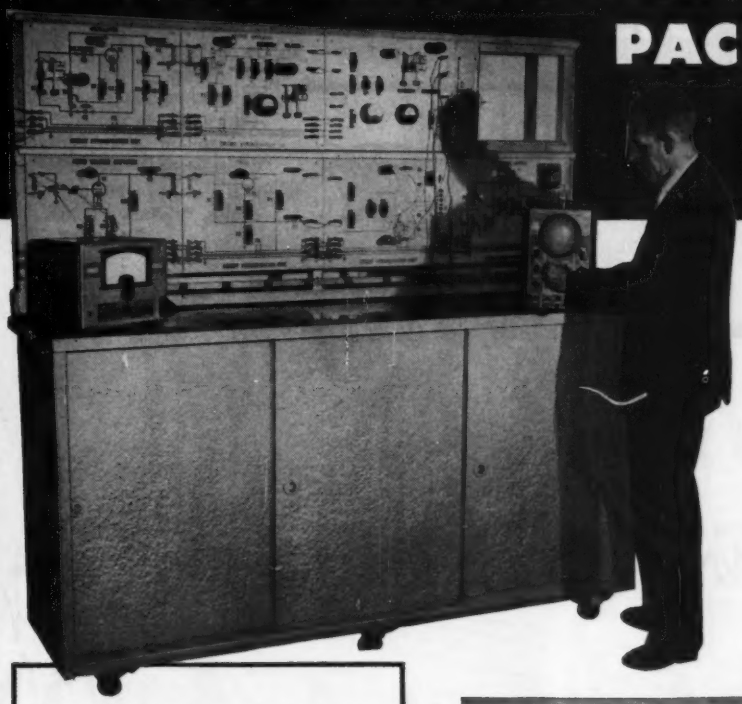
I would like to take this opportunity to compliment you on your fine magazine. All the industrial-arts teachers with whom I am acquainted appreciate the helpful, informative articles.

The teaching aids offered by your "Shop Teachers Service," in October are doubly appreciated by one whose teaching career is just beginning.

*John Moss,*
John B. Hood Junior-High School,
Dallas, Tex.

*Practical and proven programs for better electronics education . . .*

# PHILCO ELECTRONICS TRAINING PACKAGES



Philco Electronics Training Packages for High Schools employ proven methods to make teaching easier and give students a better understanding of electronics theory and applications.

The unique Philco Electronics Classroom Demonstrator presents the circuits of electronics theory a step at a time with easily learned "building block" panels.

Classroom demonstrations, laboratory experiments and tests are completely organized for the teacher in the instructor's manual . . . and all are correlated with the text book.

A variety of packages is offered. Any High School, Academic or Vocational, can select a course to suit specific educational objectives.

**THE PHILCO ELECTRONICS CONSOLE DEMONSTRATOR PRESENTS THE CIRCUITS OF ELECTRONICS THEORY AND EQUIPMENT A STEP AT A TIME WITH EASILY LEARNED "BUILDING BLOCK" PANELS.**

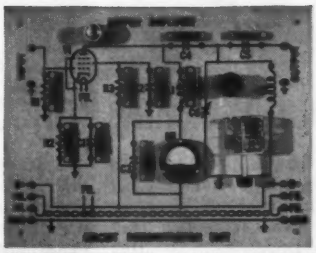
Each basic electronics circuit is separated and presented in its most widely used form for easy learning. As students learn each circuit, that "building block" (circuit) is added to the rack on the console.

Complete and functioning systems from a simple radio to a complex industrial electronics system are built a circuit at a time on the classroom demonstrator.

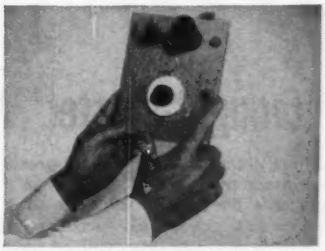
All demonstrations are explained in the instructor's manual . . . and all are correlated with the text book, lab experiments and work books.

Contained within the cabinet base are as many as 40 "building block" panels, depending upon the package selected. The entire console unit moves easily on its own casters and plugs into any regular A.C. outlet.

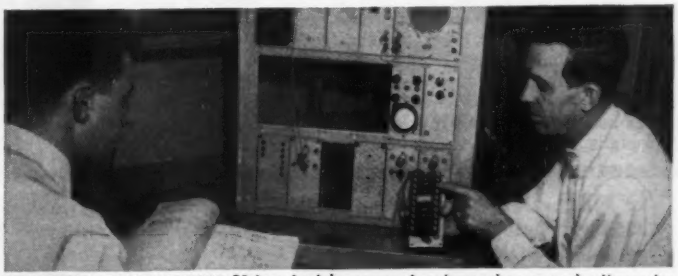
*Write today for free descriptive booklet.*



**BUILDING BLOCKS MAKE LEARNING EASIER.** Each is a basic circuit . . . function and relationship to entire system are easily explained as it is added on demonstrator.



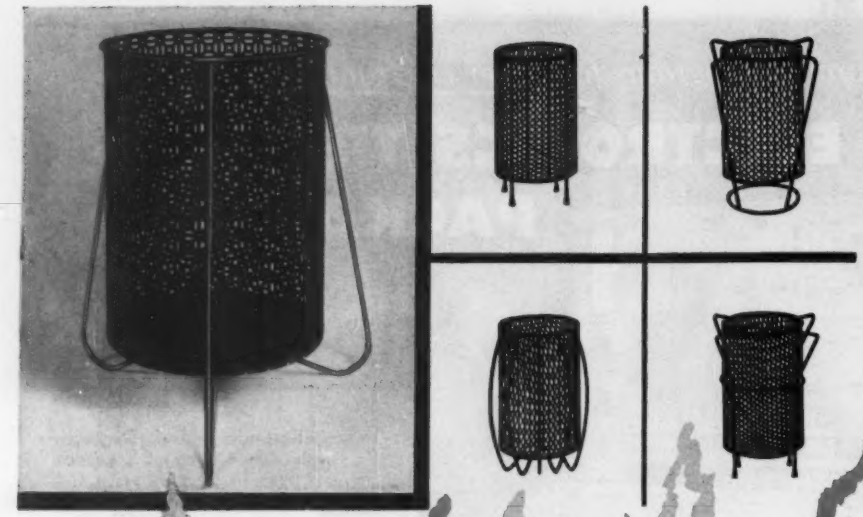
**MATCHING LAB CHASSIS.** For each "building block", there is a matching lab chassis, a complete and operating counterpart unit for laboratory experimentation.



**STUDENTS LEARN BY DOING.** Using the laboratory chassis, students can duplicate the systems presented by the instructor on the console demonstrator. Test techniques can also be taught. A complete kit of defective components is supplied for actual trouble-shooting.

## PHILCO TECHREP Division

**22nd and Lehigh Avenue** **Philadelphia 32, Pennsylvania**



**Project No. 1 is typical.** It provides a large illustration of a smart metal waste basket. This is followed by a variety of drawings suggesting other ways of handling the same project. These various designs induce the student to decide what he wants, even to developing his own design — the project becomes **"his"** by choice.

# 8 NEW IDEAS

## "thought-starter" Metal Working Projects that stimulate originality

THESE TEACHING MATERIALS present a new approach to the encouragement of individuality in project design. Each project presents five varied solutions to a design problem. Two assumptions guided the preparation of these materials: (1) students who use them will be seeking experiences in the area of cold-forming metals, and (2) some limited direction of thought along possible lines of project development makes for more efficient instruction where primary emphasis is on construction activity.

These materials are intended to help students toward eventual personal refinement of detailed project plans. Some probably will want to build designs from this folder. Others will further adapt some of the enclosed ideas. However, all should be encouraged to evolve projects of their own design. In any case, students are expected to develop their own dimentioned working drawings, bills of material, and procedural plans.

Students who build projects along the lines proposed in this folder will gain an understanding of practical design criteria and techniques. They will also increase their knowledge of kinds and characteristics of metals and of common metal forming tools, machines, and processes. Furthermore, the total learning should be increased because the experience will be both educational and personally satisfying, since each individual will make a project *he* designed and planned.

Send for your thought-starter projects today. In a folder* entitled, "METAL PROJECTS IDEAS *with variations in design*" you will receive eight projects on handy and decorative household items to help you in teaching almost every phase in the cold forming of metals. In addition, you may choose any or all three of the other folders* we have prepared to help you. They are: "Contemporary Sheet Metal Projects," "Suggestions in Wrought Iron" and "Plastics for School Shop."

**O'NEIL-IRWIN MFG. CO.**
**355 Eighth Avenue, Lake City, Minn.**

*A charge of 25¢ is placed on each project folder. Cash, money order or check **only** will be accepted.

**Please send me the project folders checked below:**

"METAL PROJECTS IDEAS with variations in design" ☐ "Contemporary Sheet Metal Projects" ☐ "Suggestions in Wrought Iron" ☐ "Plastics for the School Shop" ☐

NAME: _____ Title _____

SCHOOL: _____

STREET ADDRESS: _____

CITY: _____

di-acro PRECISION METALWORKING MACHINES

Pronounced die-ack-ro

Metal and plastics forming projects are published as a service to shop teachers, supervisors and students by the O'Neil-Irwin Manufacturing Company.

# ARE YOU THIS PLEASED ... with YOUR teaching material?

VOCATIONAL DEPARTMENT
LIBERTY HIGH SCHOOL
240 E. Elizabeth Ave.
Bethlehem, Pa.

F. J. Bacon
Vocational Counselor

L. B. Kohler, Director
Vocational Education

Mr. Howard Meeche, President
Universal Scientific Co.
P. O. Box 336
Vincennes, Indiana

August 19, 1958

Dear Mr. Meeche:

Since the end of World War II, the industrial and military technical advances have made it necessary for vocational schools to turn out a well rounded product that can quickly adapt himself to changing production and control techniques. This calls for a well rounded course in the electrical-electronic field. I found that the best way to accomplish good teaching in this field is to give the students materials and equipment to experiment with that will retain their interest and at the same time familiarize them with real electrical-electronic equipment that was designed for shop experiments.

We use Crow Model 100-G (Magnetism & Electricity), Model 500-G (Electrical Phenomena) for electrical and magnetic fundamentals, and the Model 700 (Rotating Electrical Equipment) for A. C. and D. C. machinery experiments.

I find that the flexibility of the equipment to quickly change from one machine to another makes it a very desirable teaching aid for demonstration. Also, it is particularly instructive to have duplicate equipment for the students to work with and perform the same experiments.

Student interest is unusually high when they are allowed to work with this equipment and the learning process is greatly aided.

It seems to me that teaching electrical-electronic fundamentals or electrical machinery would be almost impossible without such equipment.

Sincerely yours,

Joseph J. Risbon

Joseph J. Risbon, Instructor
Electrical-Electronics

THERE'S A CROW COURSE FOR EVERY TEACHING NEED!

**ELECTRICAL PHENOMENA**

Complete demonstration equipment for magnetism, electro-magnetism and electricity.
Model 500-G

**MAGNETISM AND ELECTRICITY**

A complete elementary electrical laboratory for the student.
Model 100-G (Part I)
Model 110-G (Part II)

CROW

UNIVERSAL SCIENTIFIC COMPANY, INC.
Box 336 SS, Vincennes, Indiana

Coordinated Teacher and Student Materials with Every Crow Course.

# STANLEY SHOP TALK

## NEW TOOLS, NEW BLADES FOR STANLEY SURFORM

The familiar file type SURFORM tool can now be fitted with any of these four blades:

**No. 294B — Regular blade  No. 298B — Half-round blade**
**No. 394B — Fine-cut blade  No. 398B — Half-round fine-cut blade**

Also available now is the handy Pocket SURFORM with fine-cut blade. This useful little tool is just the thing for shaping and trimming smaller surfaces. All Stanley SURFORM tools have Sheffield tool steel blades with 450 cutting edges.

## "BOY-PROOF" HAND TOOLS

**NO. 40 WOOD CHISEL**

This sturdy chisel has 4½" one-piece alloy steel blade and tough plastic handle permanently attached. Complete range of sizes. Trouble-free tool with long useful life in school shops.

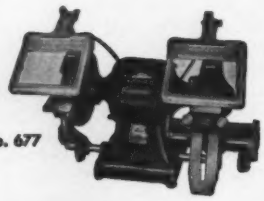
**NO. 118 BLOCK PLANE**

An all-steel, low angle block plane, this Stanley "100 PLUS" tool consists of only 3 pieces and the locked-in cutter adjustment prevents thread stripping or lost parts.

**NO. 610 HAND DRILL**

This hand drill has enclosed gears for maximum safety, a solid handle and a chuck that cannot come off the spindle. Jaw springs protected.

## BENCH GRINDER



No. 677

Especially designed for the school shop. The grinding attachment is for all chisels and plane irons up to 2⅝" wide. Equipped with "Flud-Lite" Eye Shields that cannot be moved to non-guarding position.

## NEW ELECTRIC DRILLS

Stanley recommends the ¼" H133 with 1100 rpm full load speed and ⅜" H136 with 500 rpm full load speed for school use. Full ball-bearing, lifetime lubrication and low temperature rise. Trigger switch with locking pin at base of non-slip grip. 3-jawed geared chuck.

**Use this coupon for more detailed information and school shop help.**

**STANLEY**

The Stanley Works • New Britain, Conn.

**STANLEY TOOLS, Educational Dept., 722 Elm St., New Britain, Conn.**

FREE ☐ Please send me Stanley Tool Catalog No. 34.

FREE ☐ Please send me the Stanley Electric Tool Catalog.

Name_____
Subject you teach_____
School_____
Address_____
City_____ Zone____ State_____

Hints on getting lower prices and better service

# How You Can Help Your Supplier

*By Thomas Diamond*

Former Head (Retired), Department of Vocational Education, University of Michigan, Ann Arbor

WHEN you order equipment and supplies, undoubtedly you are careful to include specifications which are intended to indicate exactly what you want and to protect the public schools from being supplied with inferior merchandise.

This is good, but it oftentimes places on the dealer conditions which result in raising difficult problems for him. In spite of all this, all reputable dealers extend themselves to adhere to the requirements set forth in the order.

Dealers in school equipment and supplies are in business to serve the schools by providing precisely what is ordered. Because they are in business, it is logical to expect them to make a reasonable profit on each order. This is a *must* if they are to stay in business.

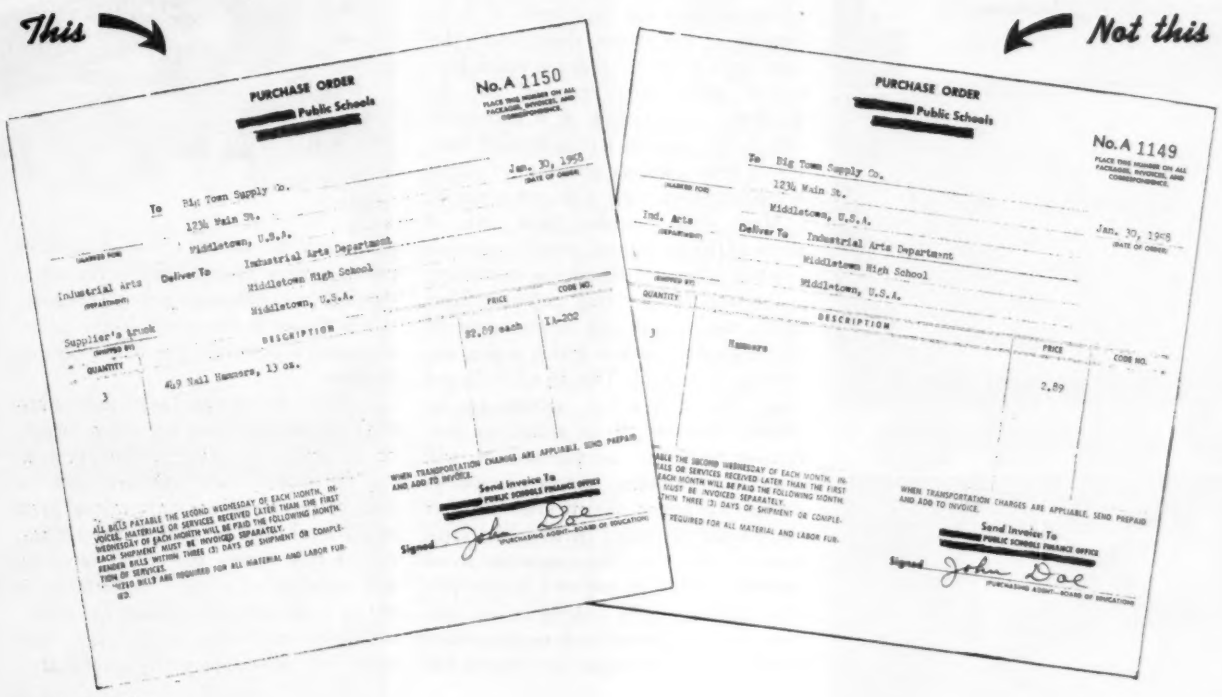
Let's look for a moment at some of the dealers' problems.

These dealers must procure the equipment from a manufacturer who expects to receive payment within the customary period during which his trade discount is allowed. The dealer is operating in a competitive market. Because of this, when he quotes a price, it is usually based on the assumption that he will be able to discount his bills. Therefore anything that happens in the school to delay payment to the dealer reduces his profit or may even cause him to take a loss on the transaction. Also, his capital is tied up in the interim.

School authorities are eager to get their orders filled at the lowest price consistent with good business and quality goods. Dealers are just as eager to quote prices that will be acceptable to their customers. This mutual satisfaction can be achieved only when the dealer receives his money promptly. This suggests that the teachers who receive equipment bestir themselves to expedite its installation, its inspection, and its approval for payment to the end that the dealer will be encouraged to submit his bids at the lowest possible figure.

Delay in the receipt of payment is not the only problem with which the dealer is faced. In one case, a machine was ordered for delivery on a certain date and it was delivered promptly on that date. Unfortunately, the plastering and wiring contracts had not been completed on the new building in which the machine was to go so it could not be installed. This forced the dealer to haul the machine back to his place of business and store it for four months, at which time it was hauled back to the school and installed. In the meantime, the dealer had to pay the manufacturer of the machine which, with other obligations, was a drain on his available capital. Moreover, he had the additional expense of handling the equipment twice which cut deeply into the profit on which the original bid had been based.

(*Continued on page* 40)



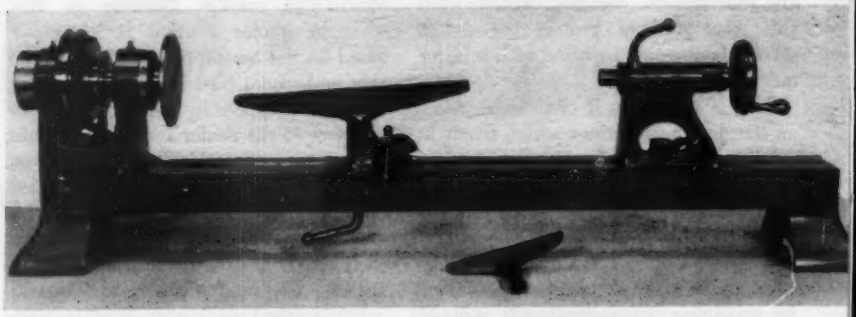
**This "father and son" teaching team—and their students—have mass-produced woodworking lathes with these**

# Production Molding Patterns

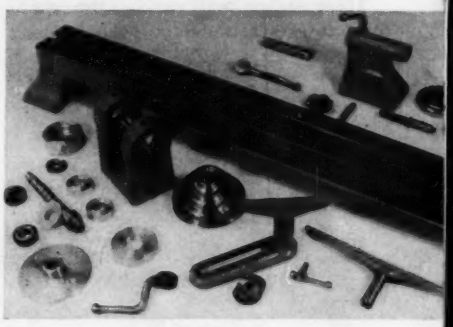
*By H. P. Gerber and H. J. Gerber*

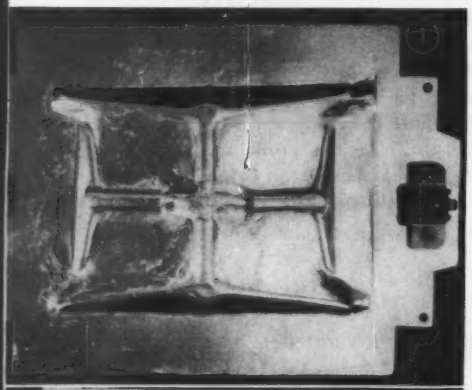
Head, (Retired), Division of Industrial Arts, Northern State Teachers College, Aberdeen, South Dakota, and Head, Machine-Shop Department, The Technical Institute of Oklahoma State University, Stillwater, respectively

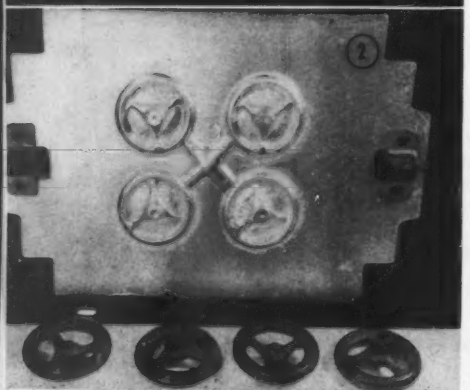
DURING many years of teaching in the metal trades it has been our experience that one of the finest and most effective motivating devices for a machine-shop course, either high-school or college level, is developing and building machine projects which are comparable in size and quality to similar products made in industry. Admittedly, these "live" projects demand a great deal of effort and considerable experience from the teacher, but the results in terms of student enthusiasm are well worth any amount of effort.

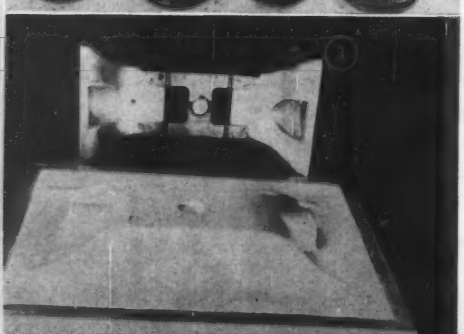


Above is a photograph of a student-built, 8" woodworking lathe. Hundreds have been built in the authors' classes. Below are the components of the lathe. The lathe bed is of rolled-steel angles that are secured to cast-aluminum legs. The other parts are cast according to the method described in the accompanying article.









Such a program has, of course, its inception in the drafting room. From that point it becomes a pattern-shop problem and this is usually where the machine-shop teacher has his greatest difficulty because the techniques of pattern making may be outside of the scope of his training and experience. It is the purpose of this article, therefore, to discuss some of the procedures which have solved, after many years of use, the problem of providing, at a reasonable cost to the student, a considerable number of metal castings necessary to supply a machine-shop class with raw material.

Many shop teachers think only in terms of the traditional pattern materials —white pine and Honduras mahogany —for building molding patterns. They think, too, of patterns in the sense of the single-unit pattern which makes one casting to a mold. This is all well and good when only a few castings are required. However, if an ambitious production program is planned it will require a continuing supply of castings over a long period of time. This requires the teacher to regard patterns the same way industry does. The single-unit wood pattern still has its use as a master pattern and for use in making larger castings. For small-sized and medium-sized work, though, the single-unit pattern has given way to various types of multiple patterns made of metal and arranged to be used in molding machines. This practice is almost as important in the school shop as it is in industry for the following reasons:

1. Cost of castings. Like other industrial operations, costs are billed largely on the amount of labor involved in making the molds. Raw materials and the melt of the metal are only minor parts of the total price of small-sized castings. All of this means that hand molding, and molding of single-unit patterns, is apt to make the cost of your castings—unless you are fortunate enough to have your own school foundry—prohibitive.

2. Wood patterns will, after long use, deteriorate and require periodic rebuilding, refinishing, or replacement.

Besides paying for themselves over and over again because of faster production of molds and negligible maintenance, metal patterns, particularly those mounted on plates or otherwise designed to fit molding machines, have several other advantages which are worth considering seriously: They will produce castings with higher surface quality with sharper defined detail. Machine-molding methods always produce castings of greater uniformity due to more precise control of mold ramming. Fragile, thin-walled patterns will, if made of wood, inevitably be broken or damaged badly in the "rough and tumble" of a production foundry. An example of patterns of this type are the tool rests in photograph #1.

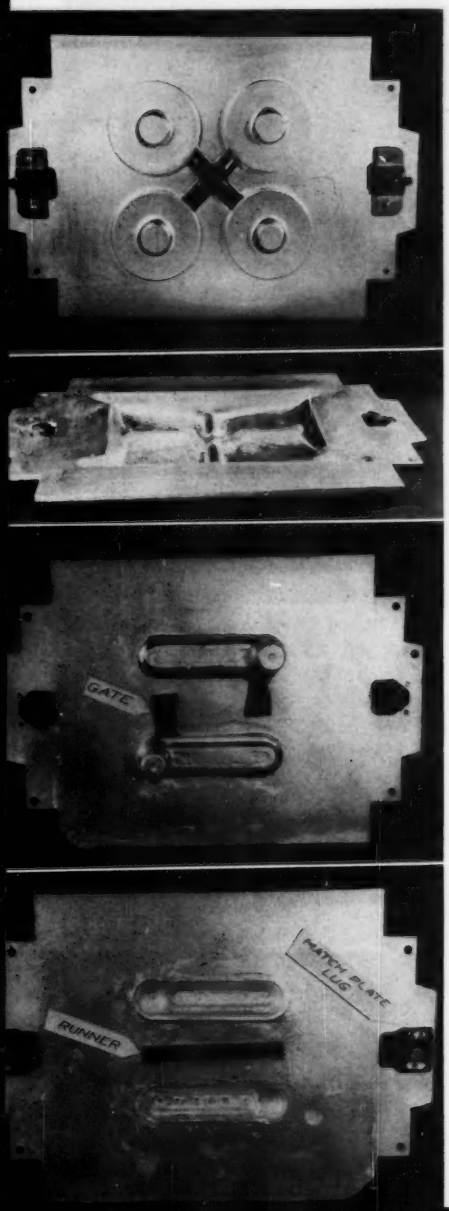
Although carefully made of laminated mahogany, these patterns can be badly battered and broken after constant use. After being rebuilt and refinished several times they are finally cast integrally into an aluminum match-plate type of pattern. No further damage or wear is anticipated even from the roughest sort of use in the foundry. Had this been done in the beginning much time and effort would have been saved, to say nothing of the lower cost that results from machine molding the match plate.

There are three methods used commonly in industry for making production molding patterns. All of these are adaptable to machine molding and all may be, and, indeed, have been, made in school shops.

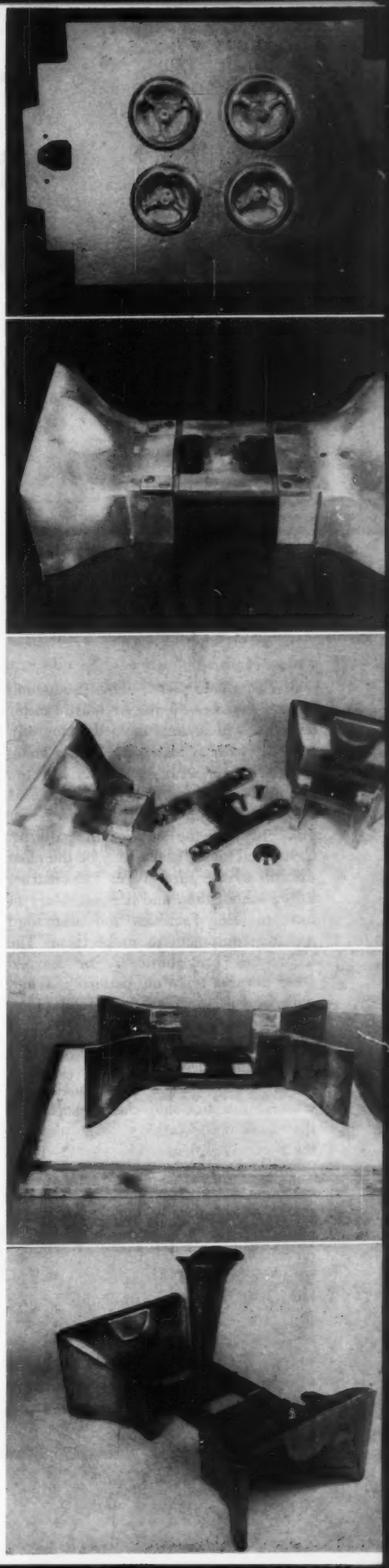
1. *The mounted pattern.* — One or more patterns are mounted on a metal plate. The plate is usually equipped with guides called "match-plate lugs" which fit the guide pins of the molding flask. Patterns mounted on these plates (they are usually made of aluminum) will almost always be joined by permanent gates and runners so that the molder is not required to use costly time to cut these into the mold by hand.

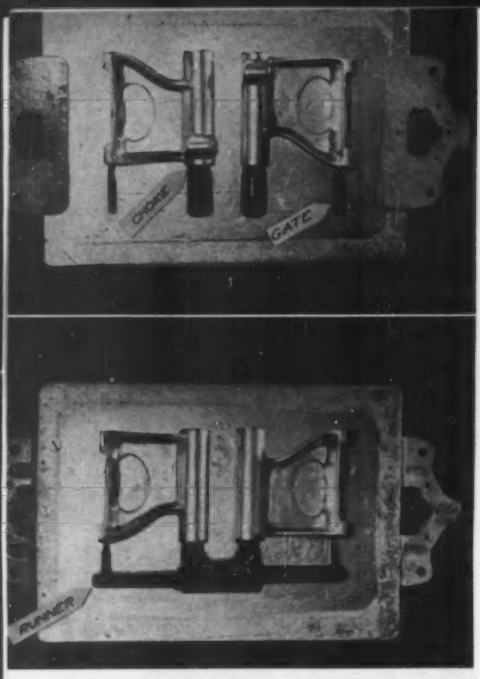
2. *Gated patterns.* — Two or more metal patterns, not necessarily from the same casting, are joined together with permanent metal gates and runners but not mounted on a plate. This process is particularly adaptable to unparted, one-piece patterns which are not of the flat-back type, or are not split in two halves and which often have an irregular part line between the drag and cope halves of the pattern. Gated patterns are usually bedded down for molding of the drag (first operation) in a sand or plaster "match" which has been cast to fit up to the irregular part line on the cope side of the pattern. An example of a pattern and match of this sort is seen in photograph #3. When the drag side of the mold has been rammed, the match remains behind and the mold is turned over for the ramming of the cope.

The pictures below show (from top to bottom): four aluminum face-plate patterns mounted on an aluminum plate (drag side) for machine molding; cope side of the tool-rest match plate; cast alumnium match plate for a pair of tool-rest slides; cope side of the cast aluminum match plate for tool-rest slides. Note the runner that connects the two gates in the drag side.




The photographs at right show (from top to bottom): the cope side of a handwheel matching plate; two aluminum patterns for lathe legs secured to the pattern by machine screws; components of the gated pattern for the lathe legs; gated pattern for the lathe legs set up and ready for molding; and a pair of castings for lathe legs made from the gated pattern, still joined by gates, runners, and the sprue.






The pictures above show (from top to bottom): the cope side of the mounted pattern for the tailstock of the lathe; the drag side of the tailstock of the pattern. Note how gates are narrowed down where they attach to patterns.

3. *The match plate.*—This production pattern consists of one or more master patterns which are molded integrally with the pattern plate rather than being secured to it with screws as are the mounted patterns. The match plate is poured with gates and runners cast in place to join the battery of patterns. Cast-metal match plates may be the most difficult of the three types to construct in the school shop and it is necessary to have molding facilities and aluminum melting equipment to make them. The techniques can, however, be learned from several texts on pattern making, and, because they are one solid piece, they are extremely durable. Illustrations #1 and #2 are examples of patterns of this kind.

An example of a popular—in our classes—machine-shop-class project is the small woodworking lathe pictured on a previous page. The various types of production patterns used to mold the castings in its construction are shown on this and the preceding pages. These patterns have been in use at a commercial iron foundry for production of many hundreds of sets of castings which have been purchased from this vendor in recent years. All of the patterns were, of course, designed to be used in molding machines such as jolt rammers and squeezers. Machine-shop classes have often machined the castings for these lathes on a production basis using jigs, fixtures, and other special tooling to process lots of 16 to 22 lathes during a semester of class work.

Now, for the benefit of those who may not be familiar with some of the principles and procedures involved in the type of pattern-making illustrated, here are some tips:

Your present wood patterns may, in many cases, be used as master patterns to mold and cast duplicates in aluminum. You must, however, take care that additional material is added to the pattern on its important machining surfaces to compensate for the double shrinkage which will result from the intermediate step involved in casting the aluminum pattern. If the pattern is not an overly large one, the dimensional change (3/16″ per foot) may not be significant and can be compensated for by careful rapping of the master pattern in the mold. Of course, the best procedure is to make a wood master pattern on which shrinkage and finish allowance is figured at the rate of 5/15″ per foot if the final casting is to be of iron.

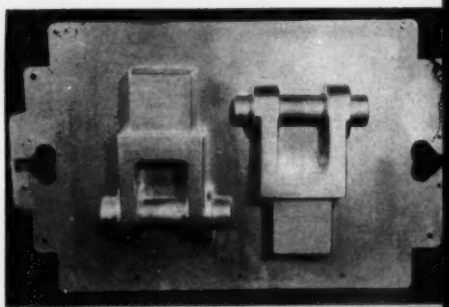
Patterns of large bulk, such as the lathe headstock pictured at right, should, when casting the aluminum pattern, be cored out to provide a wall thickness of 3/16″ to ¼″. If cast solid, it would be very difficult to prevent deep shrinks in the heavy portions. This will require making a special core box used only for this purpose and discarded after the pattern casting is poured. After the pattern castings have been molded and cast, the next step involves proper surface finishing. A smooth finish is necessary if the pattern is to draw from the mold properly. This means that side surfaces—those surfaces on which the pattern slides in the sand mold when it is removed—should be cleaned of all roughness and tool marks. Several methods can be used to do this finishing. Scraping is most often used on surfaces not readily accessible to a file. Filing, followed with finish by abrasive cloth, is also popular. Only a few thousandths need be removed if the molding has been carefully done. (Curved or bent files called "rifflers" are very useful for small inside corners or other pockets not accessible to other tools.) Make sure that all file and scraper marks run in the same direction in which the pattern will be drawn from the mold in order to prevent undercuts which will cause the pattern to hang up and break the surface of the sand mold.

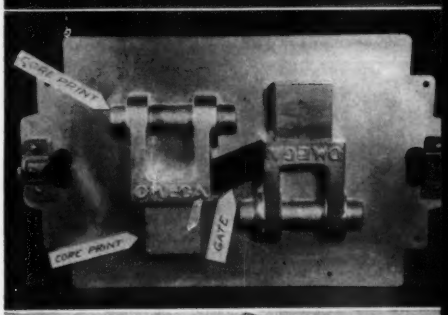
The two halves of a split pattern should be doweled together after flat machining the joint faces of each half. They are then surface finished as a unit to insure matching of all edges of the two halves. This method was used for finishing the headstock and tailstock pattterns illustrated in this article. After finishing, the two halves should be pulled apart and mounted in this same alignment on the two sides of the pattern plate.

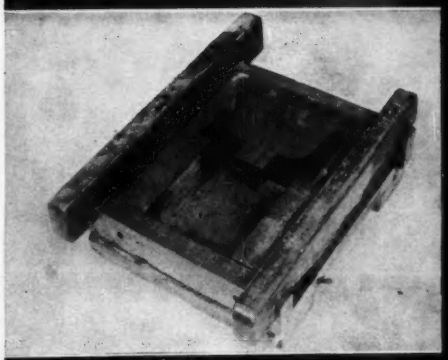
A high-speed hand grinder equipped with rotary files is also useful for finishing certain small details, like the trademark lettering on the lathe headstock. The high-speed hand grinder, equipped with a felt disc or felt "bobs" impregnated with oil and abrasive powder, can be used for the final finish. Abrasive

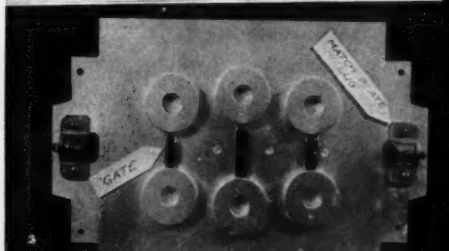
(*Continued on page* 41)

The photos below show (from top to bottom): two aluminum patterns for the headstock of a lathe secured to a 5/16″ aluminum alloy plate by machine screws; cope side of a plate-mounted headstock pattern; core box for the lathe headstock; a group of six large grease-seal patterns for the headstock. Note match-plate lugs at ends of the three plates.







Equal rights for boys and girls

# "Jeans" Meet Pig Tails in Shop and Home Arts

*By Calvin H. Dimm*

Gillespie Junior-High School, Philadelphia, Pennsylvania

Here a pretty lass is hand-setting a stick of type. How do the boys react to the usual girl tasks, and vice versa? Simple. They all love it.

WE'RE proud of the shop program in our junior-high school. At first we were somewhat apprehensive of some of its implications but we have been delightfully surprised by its success. A dozen or so years ago when the program was planned, though, we were leery, believe me.

It all started when we realized that one of the basic reasons for establishing the junior-high school—exploration—was not being carried out to its fullest extent in the practical-arts field. We realized that all of our pupils—boys and girls alike—should have the opportunity to learn to work with their hands, do and make things, so that they might be in a position to make more intelligent choices for their life's work.

In part, our reasoning rested on the fact that most chefs and tailors were men and that women were important to industry. We developed a sort of "equal rights" philosophy for boys and girls in our industrial-arts program. We had no precedent to go by, so several big questions seemed apparent which caused the mistaken apprehension.

Some of the things that bothered us at first were: How could boys and girls be integrated on an equal basis in a shop? How would this mixture affect established behavior and discipline patterns? Could a system be devised that would give all 1800 of our boys and girls adequate time in each of our six shops during their six-semester stay with us? Nobody bothered at first to ask the boys and girls about the program but we began even to wonder about their reaction? Fortunately, we went ahead. And we even added home arts and art to our program. Our plan works as follows:

There are three art rooms that accommodate three full sections at one time; six shops that take a half of a section each at one time, and six sewing, cooking, and laundry rooms that also handle half of a section each. In this way three units of three sections of each class (9B, 9A, and 8B) circulate in cycles throughout the three areas. Every six weeks the three sections of each class on the 9B-9A-8B grade level switch areas. This way each group gets to each of the areas during the 18-week semester.

The 8A-7B-7A students, smaller groups, change areas at a more frequent rate but all classes still spend 36 periods during the semester in each area.

Once we got started, to digress for a moment, some interesting questions popped up. For instance, how would boys react to the kitchen, sewing rooms, and laundry. Hm! Interesting! They loved it. Likewise, the girls got a big kick out of shop work. To our delight, mixing boys and girls together in these usually separate—on a male and female basis—activities presented few, if any, problems and the discipline problem has for all practical purposes disappeared.

Rudiments of drafting are taught in one room to 7A and 7B students. In the eighth and ninth grades more advanced drawing is offered in the planning room where the youngsters select, plan, lay out, and make patterns for projects they are making with the guidance of the planning teacher. In the hobby shop the boys and girls work with leather, plastic, balsa wood, do basketry, and fabricate objects from wood and metal.

Our metal shop is well equipped for sheetmetal, copper, baked enamel work, and plating. There are lathes for spinning and turning as well as a forge and

(*Continued on page* 33)

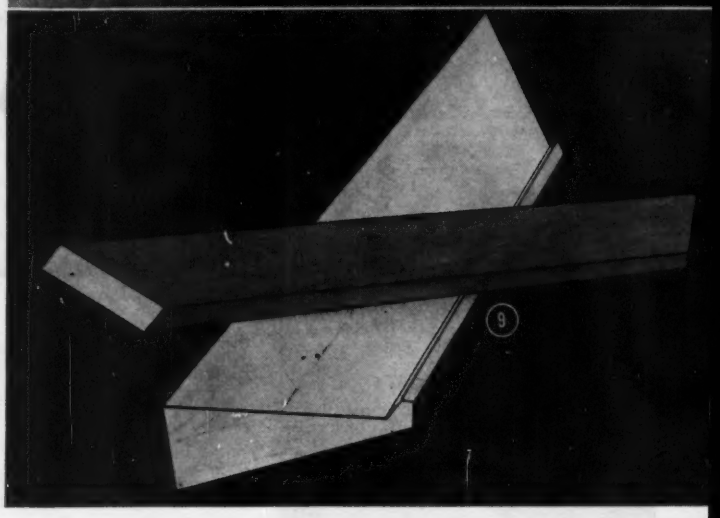
The author instructing a class in Gillespie Junior-High School's boy-and-girl industrial- and home-arts program in Philadelphia. It has been in progress more than 12 years and is considered by its faculty, and the many visitors who have called, a success. "Jeans" and pig tails meet here.

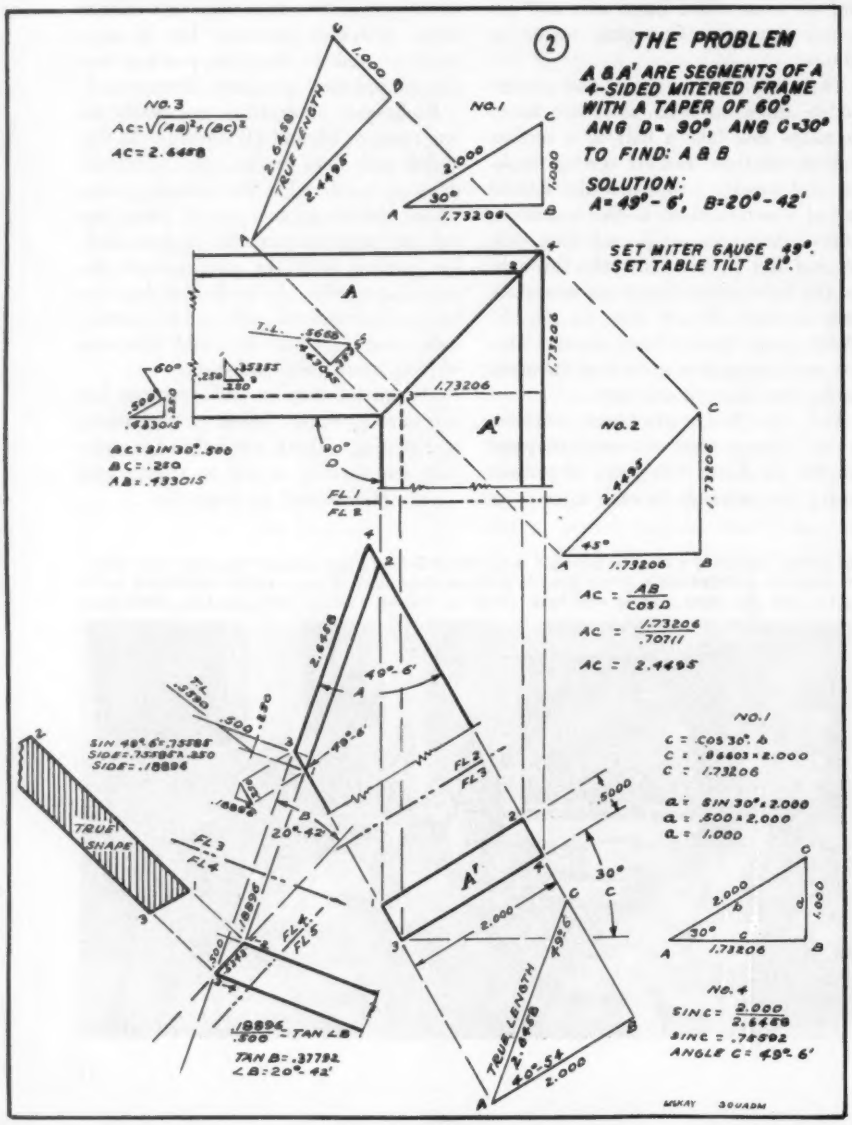
Master this and

# Compound Miters Can Be a Cinch

*By Donald B. McKay*

Head, Industrial-Arts Department, Polytechnic High School, Long Beach, California

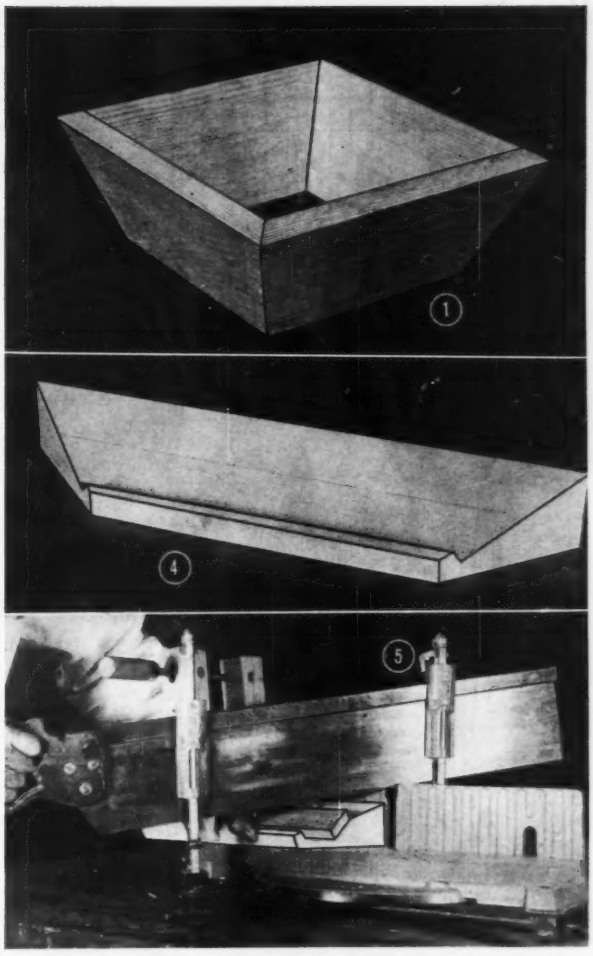



2
THE PROBLEM
A & A' ARE SEGMENTS OF A 4-SIDED MITERED FRAME WITH A TAPER OF 60°. ANG D = 90°, ANG C = 30°
TO FIND: A & B
SOLUTION:
A = 49° - 6', B = 20° - 42'
SET MITER GAUGE 49°.
SET TABLE TILT 21°.
NO. 3
AC = √(AB)² + (BC)²
AC = 2.4498
NO. 1
NO. 2
AC = AB / COS D
AC = 1.73206 / .70711
AC = 2.4495
NO. 4
SIN C = 2.000 / 2.4498
SIN C = .78592
ANGLE C = 49° 6'
TRUE LENGTH
TRUE SHAPE
TAN B = .37792
∠B = 20° 42'
MCKAY 30 QUADM

AN amateur craftsman took several successive cuts from the ends of four pieces of hardwood, intended for a picture frame, until the stock was too short for the job. He learned by sad experience that it is very difficult, if not impossible, to find the angle for hopper cuts by trial-and-error methods. Experienced mechanics, as well as amateurs, have been plagued by the mystery of finding those compound angles when a specific side slant is required. A typical hopper box is shown in Fig. 1.

Many charts and tables have been devised to give the angle specifications for compound miters. The Oliver Machinery Company has provided a chart in one of their manuals[1] which gives the miter-gage swing and table tilt necessary on bench saws to obtain the compound angle for building a hopper box of four, six, or eight sides. An issue of *Home Craftsman*[2] published a similar diagram with an article on cutting compound angles. Also, one of the Deltagram Operating Manuals[3] contains a saw-setting table for hopper cuts.

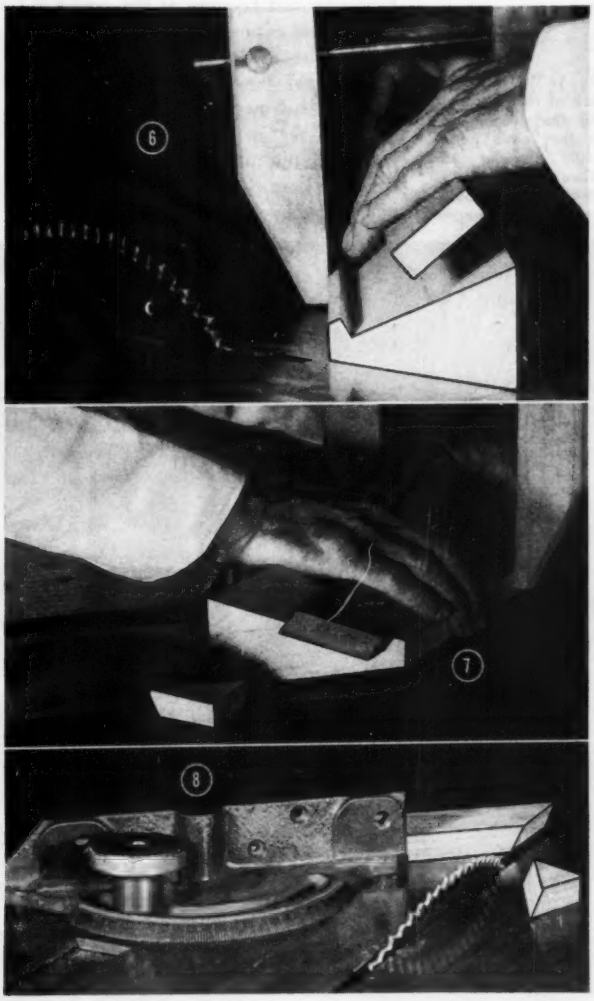
A trigonometric solution will provide a method of finding any compound angle to a degree of accuracy that is not possible by graphic methods from a diagram. The toolmaker or machinist can make machine-tool set-ups to very close limits from precise angle data. Fig. 2 illustrates the projection and calculation to obtain the compound angle for a 90° miter joint with a side slant of 30° from a plane established by the sides. Note the close limits of the angles obtained by this method.




Figs. 3 and 9 (left) are the "end" and the "means" of a knotty problem. Fig. 3 is a picture frame with compound miter angles while Fig. 9 is a jig that you can make—following Fig. 2 (lower left, preceeding page)—which will greatly simplify cutting those "tough" angles. Figs. 1, 4, and 5 (at right) are a hopper box, a jig for making cuts for the box, and one example of the jig in use. This does away with "trial-and-error."

The bevel and miter angles for the four-sided picture frame, shown in Fig. 3, are those obtained by the solution of the problem in Fig. 2.

A simple jig, such as shown in Fig. 4, will provide a sure-fire method of making hopper cuts with a given side slant. This device can be used with a miter box saw or with a table saw, as illustrated in Figs. 5, 6, and 7. When the wedge is used, the miter gage is set at 45° for sawing any square or rectangular frame, regardless of the side slant.




Figs. 6, 7, and 8 show three ways the jig in Fig. 4 can be employed with power equipment.

Fig. 8 illustrates a table saw set-up for sawing the miter and bevel in one pass.

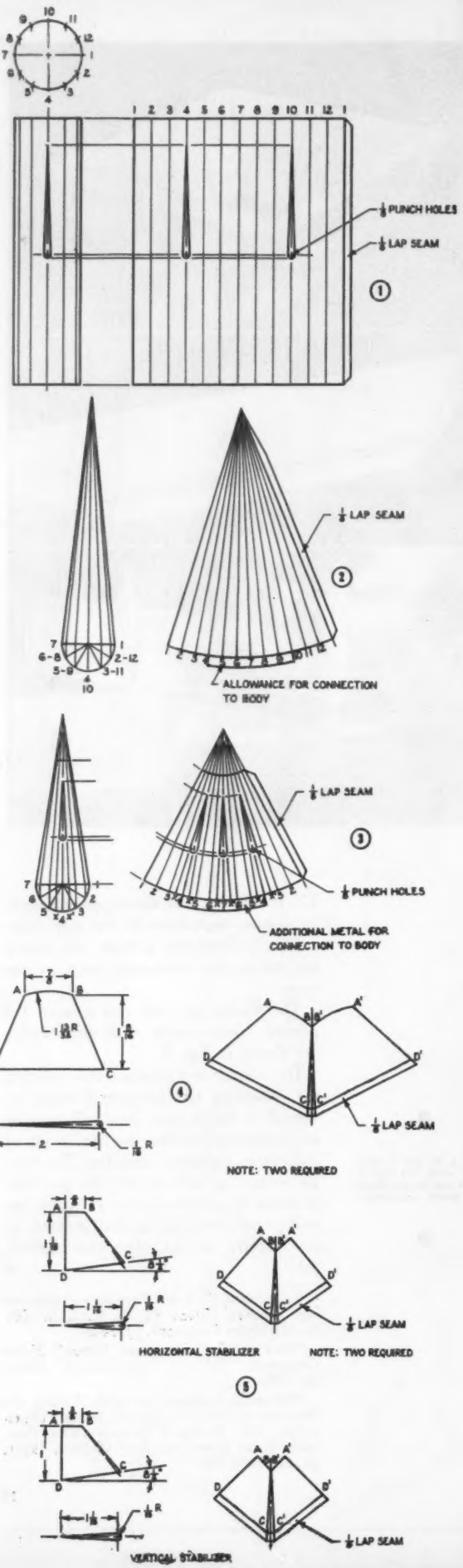
The wedge jig, and one side of the picture frame made with this device are shown in Fig. 9.

The graphic and trigonometric solution for obtaining the compound angle involved in the hopper box will provide an interesting problem for the advanced student of industrial drawing. The simple wedge jig will simplify the practical problem of construction to a degree that will permit even less skilled students to successfully do an otherwise difficult job. ★

[1] *Installation, Care and Operation of Circular Saw Benches,* (Grand Rapids, Michigan: Oliver Machinery Company), pp. 24-26.

[2a] "How to Cut Compound Miters," *Home Craftsman,* XXV: 2 (March-April, 1956), pp. 54-55.

[2] Deltagram Operating Manuals, *Getting the Most out of Circular Saw and Jointer,* (Pittsburgh, Pa.: Rockwell Manufacturing Company, Delta Power and Tool Division, 1953), pp. 40-41 and 114.




**Mole hill to mountain to a model jet Stiletto as an aid in**

# Sheetmetal Drawing

*By Richard W. Shackelford*
San Francisco, California, State College

ONE day, a short time ago, a mechanical-drawing teacher held a model of a jet Stiletto before his class. He asked the students, "How would you like to make this jet?" The response was not only spontaneous, but bordered on being overwhelming. They wanted to make the model, and immediately was not soon enough.

What was the teacher trying to do? Did he have another of those "keep the kids out of my hair" projects in mind? Evidently not because at the outset the whole idea appeared to have as its objective the achievement of an understanding of the principles involved in sheetmetal drawing. Why? Because the model of the jet Stiletto embraced a lot more of the principles of sheetmetal drawing than did the cookie cutter, tin cup, funnel, elbows, etc., that he had

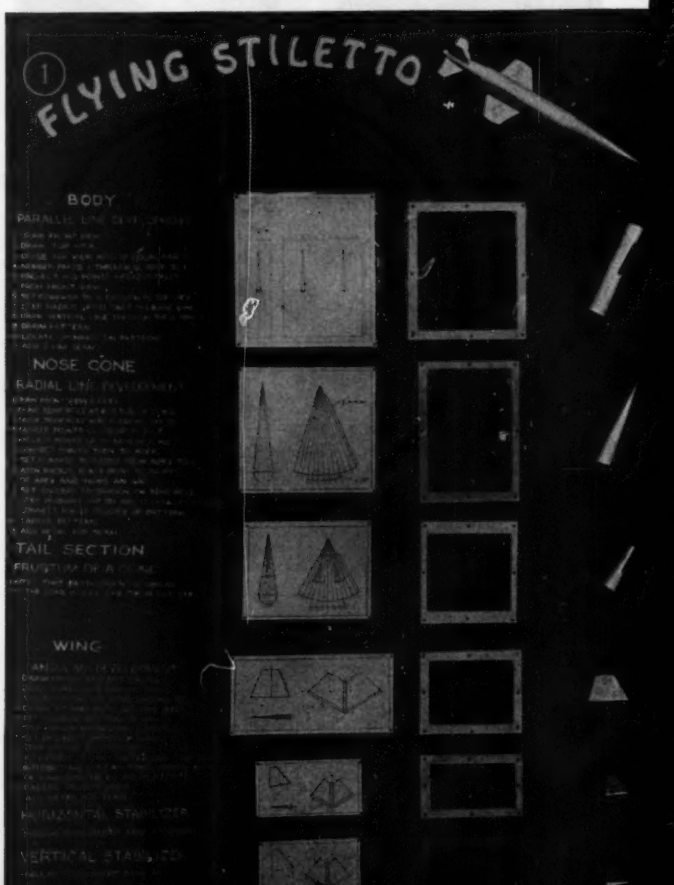



Fig. 1: This is a picture of the teaching aid that was made so that each pupil could see at all times how the "mountain" should be taking shape.

used in the past and which proved quite mediocre when the final judgment was made. As a matter of fact, most all of the principles of sheetmetal drawing are inherent in the jet Stiletto except triangulation and this can be added by merely changing the tail section or making a stand for the jet.

"Well, fellows," the teacher said, delighted his proposal had been accepted so eagerly, "you can draw this plane in five lessons. Then we'll assemble a paper model—gluing the parts—and give it a test flight. When it checks out in flight, we'll get together with Mr. Smith in the metal shop and build the jet out of tin plate. Do you think adding color and decals will 'build it up'? I think so."

And away they went. One student suggested building the jet so a $CO_2$ capsule could be used as a propellant. Another suggested Jetex fuel. Others felt fastening wheels on the top and running the plane along a wire would be a good way to hold races—if more than one model were built, that is. On and on they went, each adding a bit here, a bit there, all of it testimony to the motivation achieved.

This exciting student reaction had been anticipated. A set of instruction sheets had been prepared so that work on the Stiletto could commence immediately. The procedure follows (note drawings at left):

Drawing No. 1, the body, was drawn first because it was a simple stretch-out of a cylinder. The dimensions: 1¼" in diameter, 4½" long.

Drawing No. 2, the nose cone, has a diameter of 1" and is 4½" long. This was probably the most difficult part to form out of paper as well as tin.

Drawing No. 3 is the tail section as a frustrum of a cone, 1" in diameter and 2⅜" long.

Drawing No. 4 shows the simple, angular development of the stubby wings. (Note the lap seam so the wings can be joined.)

Drawing No. 5 is last with an angular development of the two stabilizers. These two parts are similar but the $\frac{1}{16}$" difference demands accuracy.

Fig. 1 (photo page 16) is a teaching aid that shows each student what the line of development was for the project.

In the past—and the present, in a lot of cases—the principles of sheetmetal drawing have been difficult for students to understand. Have the projects been too difficult? Has the teaching been "over the heads" of the students? Perhaps teaching and techniques and projects of the past have been more suited to adult groups. ★

**Design makes the big difference in this**

# Magazine Rack with a Modern Touch

*By Rudy Albert*

**Ypsilanti, Michigan, High School**

A PRACTICAL accessory in any home today is this magazine rack which is attractive in design and constructed to eliminate clutter. The wood chosen should give a modern design effect and, at the same time, fit in with other furniture.

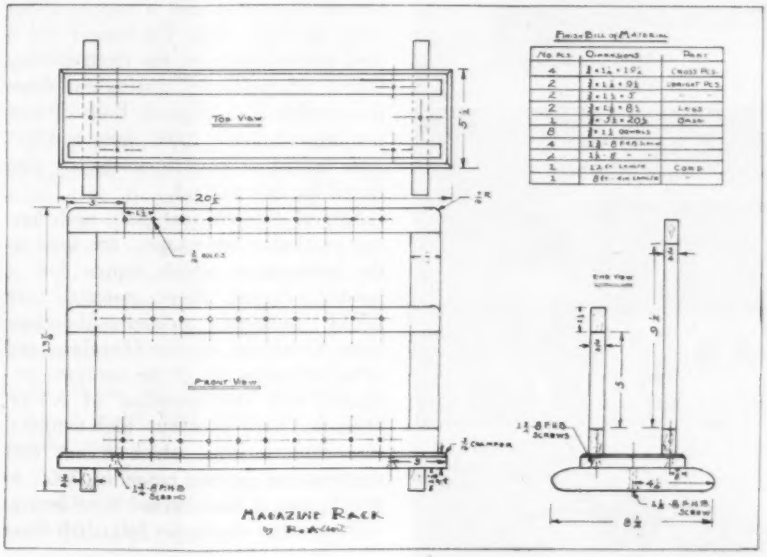
This project will give the student an opportunity to square stock, lay out pieces, make dowel joints, chamfer, shape, and apply a wood finish.

The assembly of the frames to the base should be done only after the finish and stringing have been completed.

There are other materials which could replace the plastic cord, such as dowel rods placed between the edges of the cross pieces of the frame. These dowel rods also may be woven with plastic cord, colored if you wish, to give a basket effect. Other materials which would be suitable to use are brass rod, expanded wrought metal, and basket cane.

Students will enjoy making this project for themselves or as a gift. ★

**The picture above shows the completed magazine rack holding two different sized publications. The drawing below will enable you to make a rack just like it, a handsome addition to any home. Choice of wood, finish can vary.**

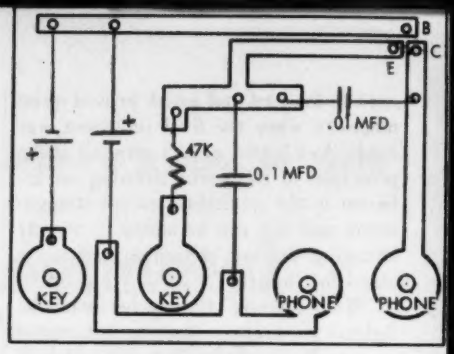


They're used in industry so

# Add Etched Circuits to Your Electricity Program

*By C. B. Porter and Tod H. Herring*

University of Illinois, Urbana, and San Francisco, California, State College, respectively




Copper Laminate Circuit
Shown Full Size

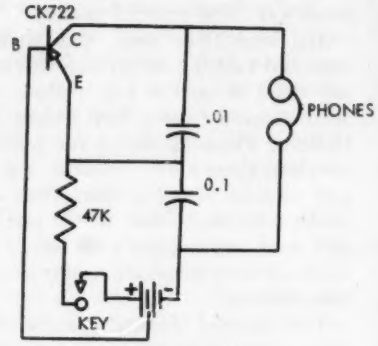
ETCHED circuitry is an electronic development that is of fairly recent origin. Some of the earliest forms of this technique were found in the proximity fuse of World War II. Certain advantages of this technique, to be discussed later, have led to its increased use in the manufacture of electronic devices such as test equipment, radios, and television receivers. Since etched circuits are rapidly replacing conventional hand wiring in the manufacture of electronic equipment, it seems that this technique should be demonstrated and used in the industrial-arts electricity and electronics classes.

## What are Etched Circuits?

The etched circuit eliminates the need for punched and formed metal chassis, numerous tie-points and terminal boards which serve to hold electronic parts, and numerous hand-placed and soldered wires. The etched circuit consists of an insulating board which has bonded to it a thin metal-foil circuit pattern, usually copper. This metal foil provides for the connections to the various electronic parts that comprise the completed circuit. The leads for the various parts are inserted through holes drilled or punched in the insulating board and soldered to the copper-foil circuit connections.

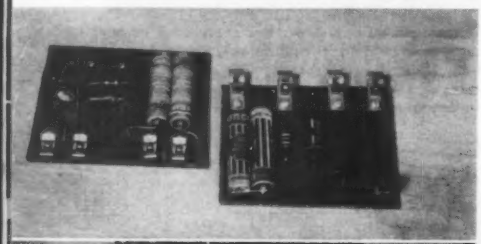
The insulating board is made by saturating paper or cloth sheets with a thermosetting resin such as phenolic resin. Stacks of the impregnated sheets are then placed in a heated press with a sheet of copper foil and subjected to a pressure of approximately one ton per square inch at a temperature of 350°F. The pressure and heat form the sandwich into a hard board with a copper-foil layer bonded to it. Copper-faced laminate is available commercially in thicknesses from 1/16″ to 3/32″ with copper foil bonded to either one or both surfaces. The copper foil used is electrolytically deposited and is usually either .001″ or .003″ thick. The copper foil is then transferred from the electroplating bath to a large, slowly rotating lead drum from which it is stripped. Rolls of copper, approximately 2,000′ long and 60″ wide and of uniform thickness, are produced by this method.

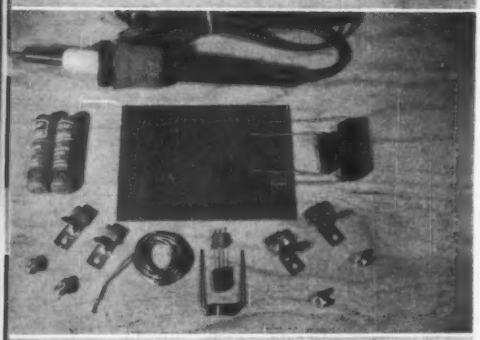
Several different materials, each having particular advantages, are used as the laminate to which copper foil is bonded. Among these materials are XXXP phenolic, melamine-fiberglass, epoxy-fiberglass, silicone-fiberglass, and teflon-fiberglass. All of the laminate materials, with the exception of XXXP phenolic, have excellent high-temperature characteristics which means that temperatures in the range of 300° to 400°F, such as encountered in soldering, will not cause the copper foil to lift from the insulating board. XXXP phenolic is least expensive and has rather poor temperature characteristics but, with proper soldering technique, is entirely satisfactory for school-shop use.




Schematic Diagram of
Transistor Code Oscillator

From top to bottom: Two transistor oscillators, one on the left made of miniature components, and the one at right made with standard parts; parts and tools needed for transistor code oscillators; and a completed transistor code oscillator made as described in this article.

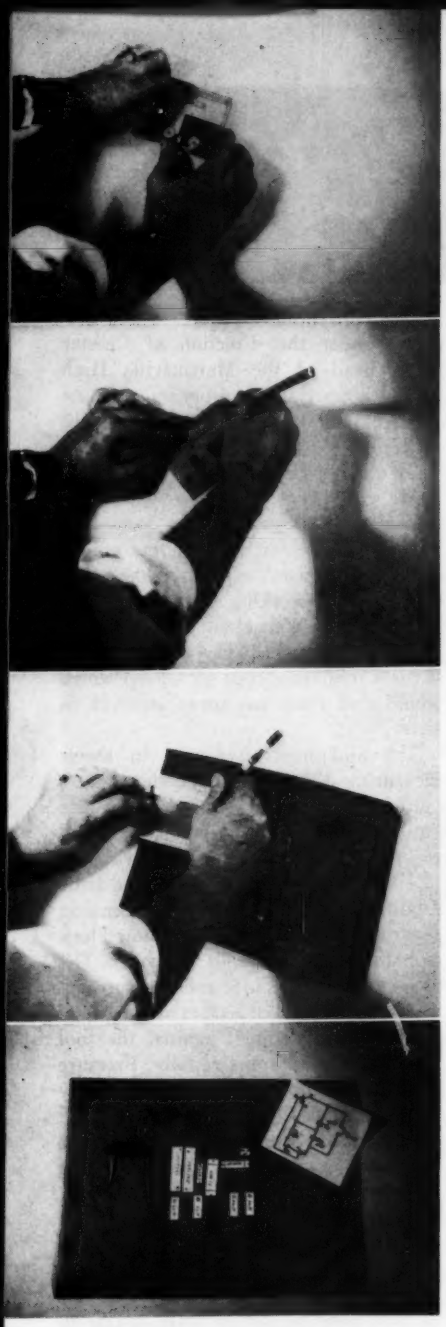




## How Are Etched Circuits Made?

Etched circuits are produced by placing a resist on the copper-foil side of the laminate in the form of a circuit configuration. The board is then placed in an etching solution which removes all of the copper not protected by the resist. After etching, the board is punched or drilled to receive the leads of the circuit components. After the leads of the various components have been inserted in the holes, they are soldered either by hand or by dip soldering.

In producing etched-circuit boards commercially, the engineer works from a schematic diagram and prepares a drawing of the conductor pattern desired for a particular piece of electronic equipment. This drawing is inked and photographed to produce a negative of the circuit. The copper-laminate is coated with a light-sensitive resist material called cold-top enamel. The negative is placed on top of the treated copper and exposed to an arc light. After exposure, the board is etched in a ferric-chloride solution. Areas of the copper,



Photos above showing (from top to bottom): steps in making the diagram for etching a printed circuit. The steps are: peeling off excess masking-tape resist; cutting out the circuit with a sharp instrument; transferring the circuit drawing to the masked copper laminate using carbon paper; and laying out the etched circuit using parts cutouts and the schematic diagram.

those that were exposed to the light, are etched away, while the areas of copper protected by the opaque lines on the negative, remain.

Other methods of producing etched-circuit boards are also used, such as offset printing and silk screen.

### What Are the Advantages of Etched Circuits?

Etched circuits eliminate wiring errors. The circuit can be reproduced indefinitely without error. Tedious hand-wiring operations are eliminated, thus reducing the time spent in numerous inspection operations. Etched circuits lend themselves to automated assembly techniques. Circuit variations due to wiring differences are eliminated.

### How Can Etched Circuits Be Prepared in the School Shop?

The photographic, printing, and silk-screen processes used commercially to produce etched circuits are, generally speaking, beyond the scope of the average school shop. However, entirely satisfactory etched circuits can be produced in the average school shop with a less refined technique which very well illustrates the principles of the commercial processes.

The transistor code-practice oscillator is an easy and inexpensive project which illustrates the process neatly. The procedure follows:

1. Make cardboard cutouts the actual size of the circuit components.

2. Try different arrangements of the cutouts to produce a circuit with as few cross-overs as possible.

3. When a satisfactory arrangement of cutouts is made, make an accurate drawing of the arrangement.

4. Secure a piece of copper laminate and remove the protective plastic coating from it.

5. Cover the copper with painter's masking tape. Be sure the tape is pressed down firmly.

6. Transfer the drawing to the masking tape by tracing over carbon paper.

7. Carefully cut around the conductor outlines with a sharp pocket knife or razor blade.

8. Remove all excess masking tape to expose unwanted copper on the circuit board.

9. Etch away unwanted copper in a 50 percent nitric-acid solution. The solution is prepared by mixing equal quantities of acid and water. *Caution: Always* add the acid *slowly* to the water in a pyrex or stoneware vessel. In case acid is splashed on the skin, flood the surface with water and neutralize it with baking soda.

10. Rinse the board thoroughly in running water and neutralize it with baking soda.

11. Drill holes for component leads with a 1/16" drill. Drill holes for 6-32 bolts with a 1/8" drill.

12. Peel off the masking-tape resist.

13. Insert parts leads from the insulated side of the board and solder (with resin-core solder) to the copper foil with a soldering pencil. *Caution:* To make a good connection do not apply heat to the copper foil any longer than is necessary. Otherwise, the foil may lift from the board.

14. Clean any excess flux from the board and spray it with lacquer or plastic.

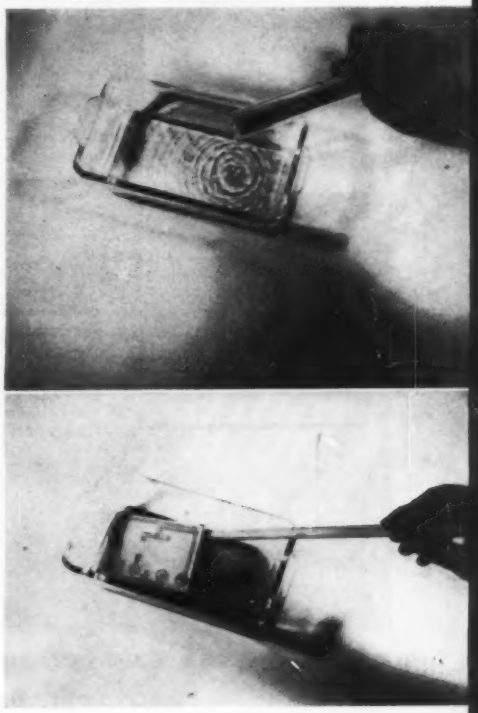
15. Insert the transistor, phones, and key.

Etched-circuit materials, such as copper laminate, liquid resist, and etching solution are obtainable in small quantities and at reasonable cost from the Bedford Company, 1132 Byron Drive, South Bend 14, Indiana. ★

**Bill of Materials**

1 Copper laminate, XXXP phenolic, 3" x 4" x 1/16"
1 47,000-ohm, ½-w resistor
1 0.1-mfd, 200-v paper capacitor
1 .01-mfd, 200-v paper capacitor
2 Dry cells, 1.5 v, Eveready #1015
1 Transistor socket
1 Transistor, Raytheon CK722
4 Fahnestock clips
4 Machine screws, round head, ¼", 6-32
4 Machine bolts, hex head, 6-32

Great care should be taken in the two steps shown below: pouring acid (top photo) slowly into a pyrex baking dish; etching (bottom photo) the circuit board in the acid solution. *Be careful!*



**Souvenirs made by shop students please delegates' wives at Virginia convention**

# 300 Spun Aluminum Bowls

Part of the 300 bowls made by three students.

SPUN aluminum souvenir bowls were the "hit of the show" at the Virginia Council of Industrial Education last spring in Lynchburg—at least as far as the wives of the delegates were concerned.

Three hundred of the 4½" bowls, mounted on pedestals, were individually crafted by industrial-education students in the Martinsville, Va., High School shops and used as favors for the wives at the convention banquet. Three students, under the direction of Chester Lane, head of the Martinsville High School industrial-arts program, were responsible for turning out the wife-bait souvenirs.

"We chose aluminum for the boys to work with because it is easy to spin, extremely malleable, easily assembled with a spot welder, takes a fine polish, and won't tarnish," says Mr. Lane. "The boys enjoyed working with it and they can spin a bowl in about seven minutes with our equipment. The finished product is a miniature copy of a bowl which would cost about five times as much in silver."

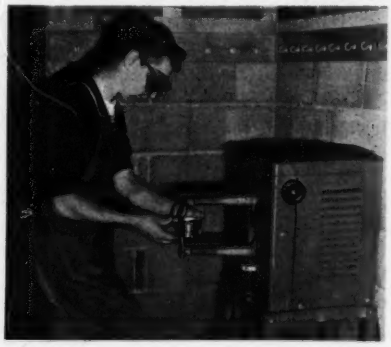
The aluminum used was in sheets measuring 3' x 8'. After the sheets were cut up into 6" and 4" squares, they were cut on a circular shear in discs destined for the top and base of the bowls.

The bowls took shape on a wood lathe modified by the addition of a spinning rest to hold the bowl and a follow block to hold the metal against the chuck. The shaping was done by hand pressure applied with the end of a tapered hardwood broom handle guided against the tool rest as the bowl spins rapidly. Pressure at just the right angle results in a simply trimmed or neatly rolled edge.

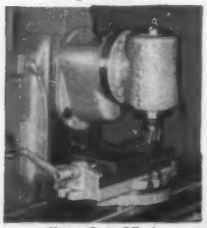
An electric spot welder sealed base and bowl together by simply melting the aluminum back to itself.

This project lends itself to any shop. In less than 10 minutes, the student is ready to apply the final patina on a portable buffing head remounted on the electric lathe he started with. Initial attempts invariably produce two obvious emotions — surprise at the quickly created beauty and a dash of pride. ★

The base and the bowl are spot welded together



Heavy Duty Vertical Milling Attachment



Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment

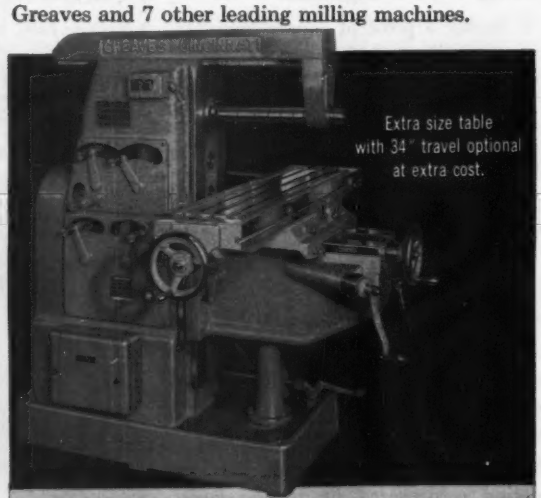
Toolmakers Overarm

**Heavy duty attachments increase versatility of dependable, low-cost**

**GREAVES MILLS**

**"THE MOST MILL FOR THE LEAST MONEY"**

A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS. Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.




**GREAVES MACHINE TOOL CO.**
2300 Eastern Avenue, Cincinnati 2, Ohio

Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.

Send information on Attachments and Accessories for GREAVES MILLS.

NAME _____ TITLE _____

FIRM _____

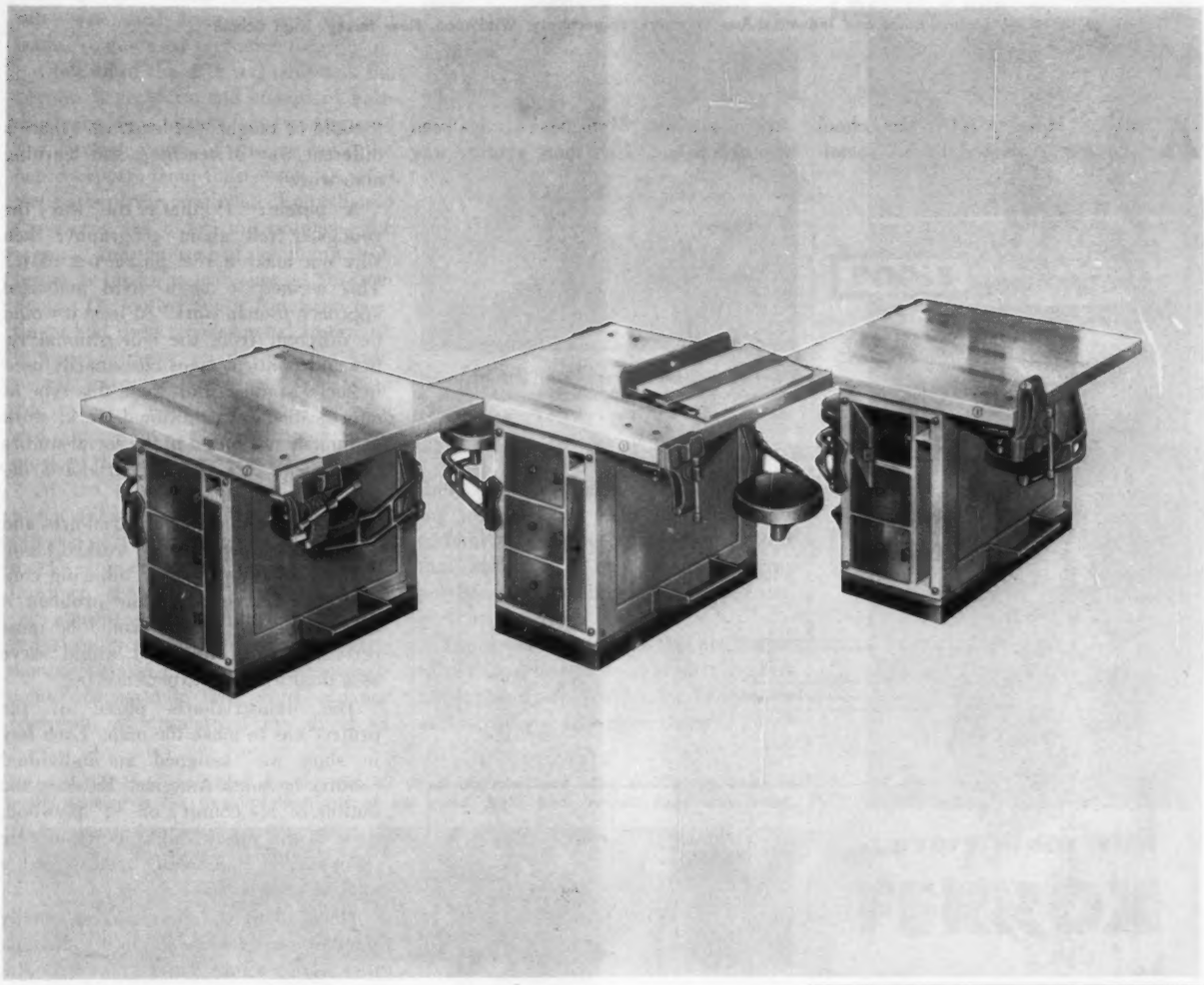
ADDRESS _____

CITY _____ ZONE ___ STATE _____

HAVE AN "EDUCATIONALLY CORRECT"

# Industrial Arts Shop

WITH *Sheldon*



## Q-1000 6-STUDENT WORK CENTER

This work center is as far advanced over old-fashioned shop benches as today's industrial arts program is over the manual training of generations ago. Six students can be accommodated at this Sheldon center. Each roomy work station has drawing board, combination metalworking-woodworking vise, electrical outlet, swinging seat, footrest, storage for books and supplies. In efficiency and ingenuity it typifies the step-saving, time-saving planning that goes into the Sheldon Industrial Arts department. Get the complete story. Write for information on the dozens of benches, cases, cabinets, and other facilities Sheldon offers modern Industrial Arts education. Planning and recommendations without obligation.

E. H.

*Sheldon*

EQUIPMENT CO.

MUSKEGON • MICHIGAN

*WRITE FOR LITERATURE ON "EDUCATIONALLY CORRECT" FACILITIES FOR*

**SCIENCE • JUNIOR SCIENCE • HOMEMAKING • ART • INDUSTRIAL ARTS • MUSIC**

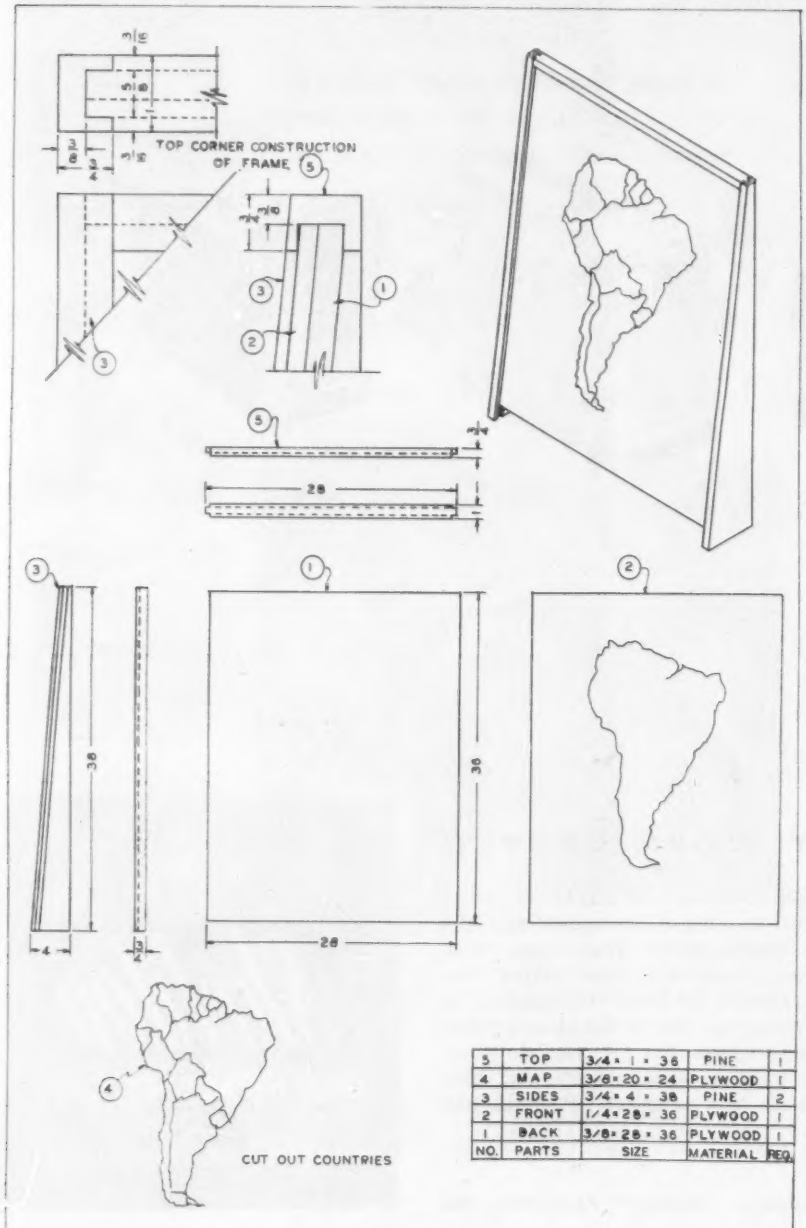
A story about integration

# Industrial Arts and Social Studies

*By Romolo Nardi, Jr., and Raymond Teitelman*

Social-Studies and Industrial-Arts Teachers, respectively, Wildwood, New Jersey, High School

A SEVENTH-GRADER in our school one day remarked to his social-studies teacher, "Maps have always been a puzzle to me. Isn't there another way it could be taught? At least, isn't there a different way of teaching and learning map work?"




| NO. | PARTS | SIZE | MATERIAL | REQ. |
|---|---|---|---|---|
| 5 | TOP | 3/4 × 1 × 36 | PINE | 1 |
| 4 | MAP | 3/8 × 20 × 24 | PLYWOOD | 1 |
| 3 | SIDES | 3/4 × 4 × 36 | PINE | 2 |
| 2 | FRONT | 1/4 × 28 × 36 | PLYWOOD | 1 |
| 1 | BACK | 3/8 × 28 × 36 | PLYWOOD | 1 |

A puzzle? If that's the way the youngster felt about geography, then why not make a real puzzle out of it? This seemed to be a vivid and real approach to map work. At least it would be different from the conventional relief and political maps customarily used in social studies. But, then, this type of effort called for additional work, work ordinarily not found in the social-studies department. So, the industrial-arts department was called in.

From here on the industrial-arts and social-studies departments worked hand-in-hand on the project. Following considerable discussion of the problem it was agreed the project would be most certainly worthwhile and would serve as a dual learning experience.

The industrial-arts phase of the project was to make the map. Each boy in shop was assigned an individual country in South America. He drew the outline of his country on 3/8" plywood, went to the jigsaw, and cut it out. He then sanded it smooth, and applied a coat of paint.

Once all of the countries—a goodly number—had been made in this fashion, they were assembled and a master board, or "base map", of 1/4" plywood was made. This base map served as the outer shell for the puzzle. On this shell, the boys in shop indicated the major geographical characteristics of the continent, such as lakes, rivers, major regions, mountain chains, and the oceans.

So far this might appear to be a stag affair. However, the girls were not just idly sitting by. They, too, had their assignments. Their jobs were to gather —on an individual basis—vital data pertaining to the continent and each of the countries. They had to gather such information as the capitals, populations, chief cities, major products, etc. Group work was then started to integrate all of this information and transfer it to

the plywood replicas of the Latin-American countries made in the shop.

Pin flags were used on the "puzzle" to indicate sources of major products. Stars were placed in appropriate positions to show where capitals and major cities were located. Plastic outlines—in colors—were cut out and affixed to the shell to show major regions and the extent of their boundaries. Finally, knitting yarn—a net work was the result—was used to represent air and trades routes used in commerce.

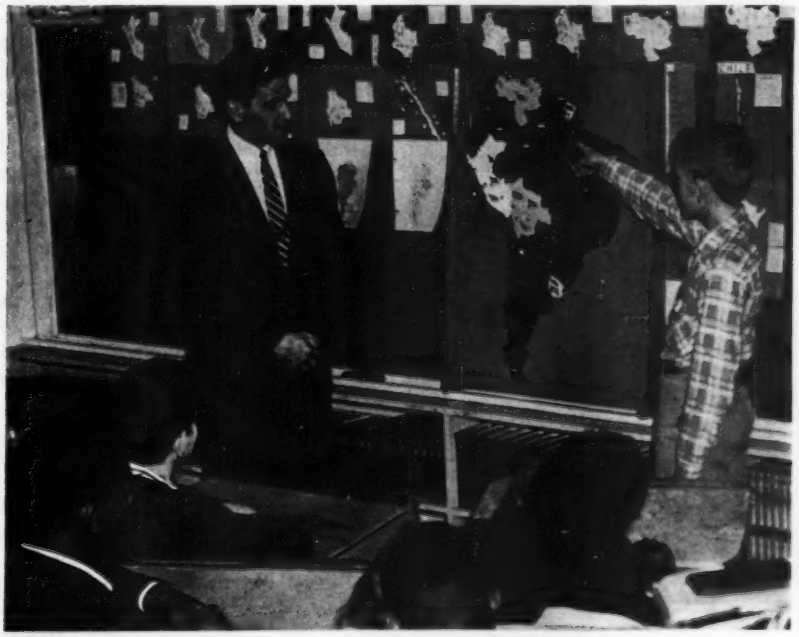
Once all of the data was collected, the various flags, stars, and strings of knitting yarn were all in place, we resumed our formal study of the region. We heard reports from individuals on various parts of the continent. Immediately the rivers, the cities, the products, the regions, and the lines of communication began to make more sense to the students. The entire South American continent had been reconstructed as though it were a jigsaw puzzle and the individual, irregular shaped parts began to add up to a unity that could be seen and understood as a whole. Some, if not most, of the facts were less puzzling.

Industrial-Arts Instructor Teitelman supervising a shop student cutting out a Latin-American country on the jig saw for the project.

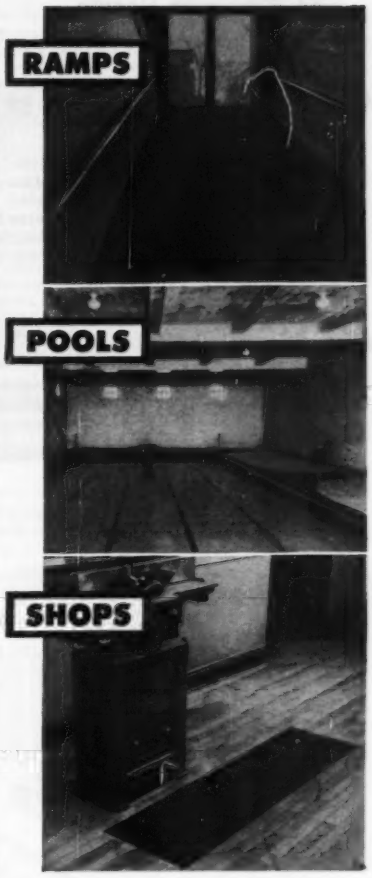
At the nominal cost of $7.74 this visual aid has become a permanent and integral part of the social-studies department's equipment. Far more important, however, are the many valuable learning experiences acquired in both the industrial-arts and social-studies departments. It showed, too, what interdepartmental cooperation and effort can accomplish. It dramatized for all of us that industrial-arts is more than learning to perform certain operations with certain tools and social studies is more than sitting in a class so many hours per semester learning a prescribed curriculum.

The enthusiasm which this project received launched us on a similar venture for our study of New Jersey. That leaves us 47—woops, 48—more states to go. ★

Social-Studies Instructor Nardi meeting with his geography class and using the "puzzle" map of South America in the study of that part of the world. Note trade routes, flags, and colors.




STOP FALLS




...every place with

FERROX

Trowel on. Dries quickly. Provides safe non-slip footing on all surfaces, wet or dry. Resists oil, chemicals, water and weather conditions. Adheres firmly to wood, concrete and metal. One gallon covers approximately 35 to 40 square feet.

AMERICAN ABRASIVE METALS COMPANY
465 Coit Street, Irvington 11, New Jersey

Please send more information on Ferrox.

Name .....

School .....

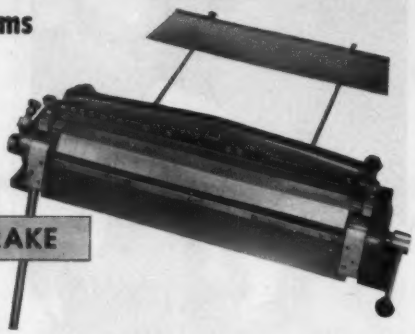
Address .....

City ..... State .....

# BERKROY

24" & 36" SHEET METAL TOOLS

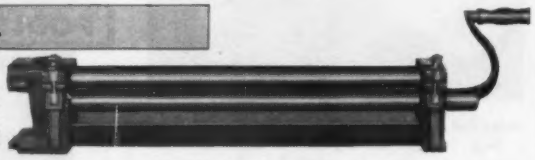
**Enlarged Training Programs Possible With These Production Tools of Advanced Design**



## 24" & 36" BOX AND PAN BRAKE

Turning a knob provides infinite adjustment to any angle from 0° to 135°. Forms any size box or pan from ½" to 24" by ¼" graduations. Makes intricate folds, reverse bends and radius bends on sheet steel up to 16 gauge and up to 36" wide. Bending leaf operates on Torrington Needle Bearings. Full 1" clearance between top fingers and anvil. Maximum 2½" box or pan depth permits deeper bends.

## 24" & 36" SLIP ROLL



Finger-tip controls on both ends of top roll permit quick adjustment for any material thickness within capacity of unit. Will accurately roll 36" widths in 20 gauge mild steel—heavier gauges in narrower widths. Removal of work is easily accomplished due to the spring loaded, hinged, top roll. Heavy duty rolls—distortion proof channel iron base, enclosed gears and oilite bearings are a few of many features.

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

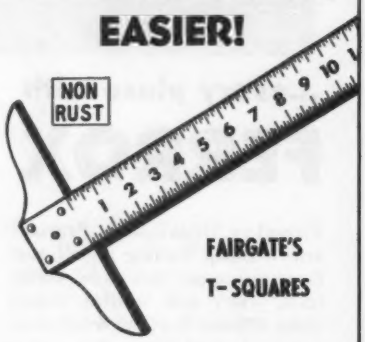
*For catalog information write to*

**BERKROY PRODUCTS CO.**

1171 EAST 32ND STREET LOS ANGELES 11, CALIFORNIA



**Makes Good Workmanship EASIER!**




FAIRGATE'S T-SQUARES

| | |
|---|---|
| 12" $1.00 ea. | • HARD ALUMINUM |
| 15" 1.40 ea. | • LIGHT WEIGHT |
| 18" 2.00 ea. | • SECURELY RIVETED |
| 24" 5.50 ea. | • LEGIBLE |
| 36" 6.75 ea. | |

Send for Catalog

**The FAIRGATE RULE COMPANY**

HARD ALUMINUM RULES, T-SQUARES, TRIANGLES

COLD SPRING 45 N. Y.



**Teach Modern Wood Finishing** with the famous

**SEALACELL PROCESS**

The "Wipe-on" Finish that

- Eliminates dust troubles
- Requires no brushes
- Protects and preserves wood
- Needs no sanding between coats

**SPECIAL OFFER**

Our new pocket size Sealacell Penetrating Process Wood Finishing Manual is free on request. Additional student copies sent free with your order of materials.

**GENERAL FINISHES SALES and SERVICE CO.**

1548 West Bruce St. Milwaukee 46, Wis.


# *strictly personal

WILLIAM COOK ASH, emeritus professor of education at the University of Pennsylvania, died Oct. 25 at the age of 82. Mr. Ash, called the "father of vocational education in Philadelphia," was principal of Philadelphia's first trades school from 1906-1918. He later was first city director of vocational education and pioneer director of vocational teacher-training at the University of Pennsylvania.

JOHN CLAUDE, manager of school sales for Delta Power Tool Division, Rockwell Manufacturing Company, since 1950, has retired. He had been in the school shop field for 35 years.

RICHARD E. BASS, formerly Virginia State agricultural supervisor and a former president of AVA, is now director of vocational education for Virginia.

FRANK B. GALE, director of vocational education for the Virginia State Department of Education, died in October.

JOHN PLENKE, JR., has succeeded H. C. THAYER, retired, as chief of T & I education, Wisconsin State Board of Vocational and Adult Education.

ROBERT VAN TRIES, formerly T & I supervisor at Albert Lea Public Schools, Minn., is now supervisor of T & I education for the state of Minnesota.

LLOYD P. NELSON has been named successor to the late FRED SCHMIDT as head of the industrial-arts department, Ball State Teachers College, Muncie, Ind.

RICHARD D. BOSS, formerly director of adult and vocational education at Roseberg, Ore., is now in charge of the same type of program at Astoria, Ore.

GAIL MOORE, supervisor of T & I teacher training in the Bureau of Industrial Education, California State Department of Education, died Dec. 7 at the age of 61. He had spent 32 years in industrial education.

RAYMOND VAN TASSEL has been named acting chairman of the department of vocational education, New York University, succeeding the late ROBERT L. THOMPSON.

RALPH K. NAIR, associate professor of industrial arts at the University of California, Santa Barbara, is now also assistant director of relations with schools for the state-wide University of California.

JOHN DAVIS has been named consultant in industrial education at Fresno,

Calif., to assist ROBERT HANSLER in the industrial-arts program in the city schools.

ERNEST H. COLTON, principal of Rome Trade School, N.Y., recently resigned.

DONALD E. HEPLER, formerly industrial-arts teacher at Avonworth High School, Ben Avon, Pa., is now associate professor of industrial arts at State Teachers College, California, Pa.

J. B. WHITELEY, formerly state director for the Vocational Industrial Clubs of Texas, has been appointed industrial teacher-trainer with the Engineering Extension Service, Texas A & M College, Bryan.

MARTIN E. GONSER is a new member of the industrial-arts department at Fresno State College, Calif.

CARL E. FRANKSON, chairman of the industrial-arts department at Montclair State College, Upper Montclair, N.J., is on a 21-month assignment as technical adviser to the Bangkok Technical Institute in Thailand.

LAWRENCE F. ASHLEY has retired as assistant superintendent in charge of vocational education at Yonkers, N.Y.

SHERMAN R. MEARS is now director of vocational education for Utica, N.Y.

RAYMOND S. GINN, JR., formerly an industrial-arts instructor at Lanier Junior-High School for Boys, Macon, Ga., is now industrial-arts consultant in the Vocational Education Division, Georgia State Department of Education.

ALVIN WHITE is now head of the industrial-arts department at Southeastern State College, Durant, Okla., succeeding C. B. FRENCH, retired.

HERBERT M. MAPES has retired as director of vocational education in Buffalo, N.Y.

NELSON J. MURBACH has succeeded WILLIAM FENNINGER, retired, as chief of the Bureau of T & I Education for New York State.

CHARLES D. BATES, formerly director of industrial education at Greensboro, N.C., is now assistant supervisor of T & I education for North Carolina.

RUSSELL G. LOUIS, who has spent the last 2½ years developing an industrial-arts program in Haiti, has returned to the industrial-arts teacher education staff at Virginia Polytechnic Institute, Blacksburg.

ROBERT W. HAWLK, formerly a teacher at Stroudsburg, Pa., has been added to the industrial-arts staff at Ohio University, Athens.

JAMES K. WARD has been named to the industrial-education staff at East Texas State College, Commerce, to teach electricity, metalwork, and power mechanics. ★


YOU TEACH ELECTRONICS EASIER, FASTER WITH EICO KITS & INSTRUMENTS

EXCLUSIVE VISUAL TRAINING AID!
Vacuum Tube Voltmeter DYNAMIC DEMONSTRATOR ONLY $10.00
Simulates EICO #221 VTVM in all its functions and ranges. Helps you teach the use and reading of the VTVM with giant 13" meter scale. 14¾" wide x 23" high x 3½" deep. Easily viewed by the complete class. Punched holes for easy hanging. Steel cabinet, aluminum panel.

EICO KITS are top-quality professional TV/radio/electronic test instruments, hi-fi components & amateur radio gear — embody latest performance-proven design and circuitry. Complete with all parts, pre-punched chassis, deep-etched aluminum panel, rugged steel case — plus pictorial diagrams; schematics; data on color codes, soldering, tools. "Beginner-Tested" step-by-step instructions help the student learn by "doing it himself" — quicken his familiarity with the construction, operation and maintenance of electronic equipment. Used by leading vocational schools, colleges & universities throughout the U.S. and the world. Over 1 million sold to date. LIFETIME service & calibration guarantee at nominal cost.

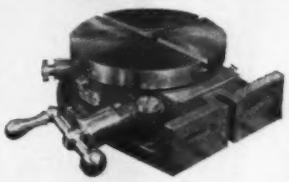
FREE ELECTRONICS WALL CHART of official IRE-EIA symbols, conversion tables, other reference data. Ideal for classroom instruction.
EICO, 33-00 N. Blvd., L. I. C. 1, N. Y SS-2
Please send free Wall-Chart, catalog & name of neighborhood supplier.
NAME.....
SCHOOL.....
ADDRESS.....STATE.....
CITY.....

TEACH METAL SHOP with the ECONOMICAL TOOLS used by INDUSTRY

3-WAY ANGLE VISE

Your students will learn simple and compound angle set ups for any machine tool used in tool room or on production ● Double swivel cradles (each allowing 90° adjustment), over a full swiveling base (allowing 360° rotation) for three separate motions —individually adjustable and lockable ● Fully graduated.

UNIVERSAL ROTARY TABLE

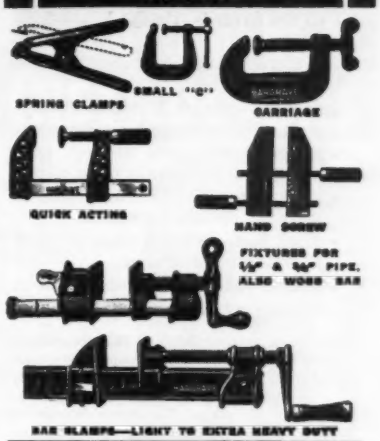


Ideal for practical experience with rotary table ● The most versatile and accurate Rotary Table at its price ● Can be used vertically and horizontally ● Ground lead worm, tapered roller bearings, fully graduated dial and table, coolant trough ● Full line of attachments ● 9", 12" and 15" sizes.

WRITE FOR YOUR FREE COPY OF 24-PAGE CATALOG PACKED WITH INFORMATION

UNIVERSAL VISE & TOOL CO.
PARMA 16, MICHIGAN

H HARGRAVE
The Complete Line of Tested TOOLS




PRO-TECTO-HED CHISELS AND PUNCHES

INDIVIDUALLY TESTED
Trip Hammer Forged For Safety

STOCKED BY YOUR LOCAL DISTRIBUTOR
WRITE FOR FREE CATALOG
THE CINCINNATI TOOL COMPANY
4069 Montgomery Rd., Cincinnati 12, Ohio

NEW

water-based
non-flammable

THE MOST IMPORTANT ADHESIVE DEVELOPMENT IN YEARS!

- **no fire hazard**—absolutely non-flammable.
- **non-toxic**—will not harm skin, no dangerous fumes.
- **no mess**—washes off hands and equipment with warm, soapy water.
- **economical**—same amount goes TWICE as far, spreads more evenly.
- **easy to apply**—use brush, roller or spray . . . no thinning needed.
- **dries fast**—tells you when its ready to bond by color change.
- **strong bond**—holds just as well as solvent-type . . . highly heat resistant.

*Get your catalog sheet on this sensational new product today. It has complete price list and stock numbers for easy ordering. Write The Borden Chemical Company, Consumer Products Dept. SS-29, 350 Madison Avenue, New York 17, N. Y.*

Revive an old art and teach

# Basket Weaving


*By Alvin R. Lappin*

Assistant Professor of Industrial Arts, San Jose State College, California

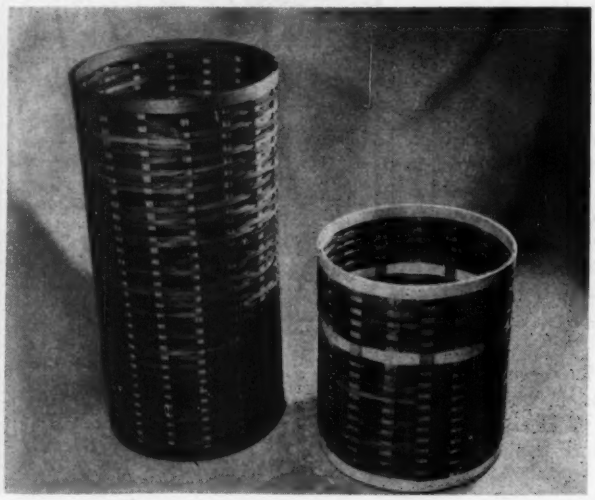

HERE is a project that is old in origin yet contemporary in design: basket weaving. Baskets may be woven from scrap materials or strips of veneer.

Almost any of the hardwoods are suitable for this project, although the less brittle varieties are recommended. If you desire to use scrap materials, it is best to select pieces that are straight grained.

**Procedure**

1. Determine the height and diameter of the basket to suit your needs. Keep it in good proportion.
2. Select the material to be woven and reduce it to $\frac{3}{8}$" in thickness.
3. Use a combination circular-saw blade and rip strips 3/32" thick from the $\frac{3}{8}$" pieces. (No particular length is necessary as long as the strips are sufficiently long to reach across at least three of the vertical members of the basket.)
4. Cut 16 strips $\frac{1}{8}$" x $\frac{3}{4}$" x desired length for the vertical members.
5. Saw a disc of a desired diameter from $\frac{1}{2}$" plywood for the bottom of the basket.
6. Lay out 16 uniform spaces at the edge of the plywood bottom.
7. Glue and nail the 16 strips to the edge of the bottom at the located points. (Drill the strips to take the nails if necessary to prevent splitting.)
8. Begin weaving by working a strip in and out between the vertical members that are fastened to the bottom.
9. Push this woven strip to the bottom making certain that its ends are centered on one of the vertical members at the inside of the basket. Place a dab of glue under each end of the woven strip.
10. Repeat the weaving operation until the basket is completed. (If the wooden strips are brittle, they can be prevented from breaking by soaking them in water until they are pliable.)
11. Saw off any vertical members that extend above the woven strips.
12. Cut three strips of wood, 3/32" x $\frac{3}{4}$" and of sufficient length, to reach around the circumference of the basket.
13. Glue and clamp one strip inside and one outside at the top edge of the basket to form a rim.
14. Glue and clamp or nail the third strip to the outside bottom edge of the basket.
15. If the strips were soaked in water to make them pliable, allow them to dry, then sand all sharp edges.
16. Coat the basket with linseed oil to put "life" into the woven wood.
17. After the oil has soaked into the wood, an appropriate finish may be applied.

The only limitation to the possibilities in design of this project is your imagination. Many color schemes may be used, and with a little practice you can make baskets that are barrel shaped, flared at the top, small at the center and flared at both top and bottom. ★



Two baskets woven from scrap wood. Color schemes and shapes can be varied to suit your taste and needs. The only limitations are those set by your imagination.

BUY
WILTON
MACHINISTS' VISES

*with lifetime sealed in lubrication!*

BUY
WILTON
WOODWORKERS' VISES

*...they're wearproof and boyproof!*

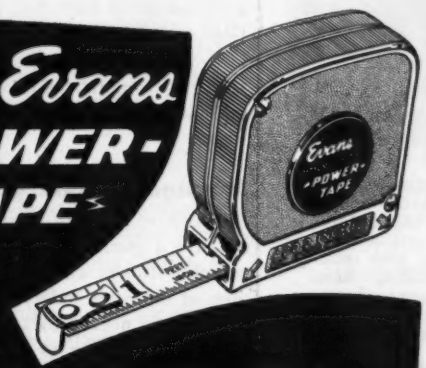
Buy WILTON because the finest costs no more! Write now for our FREE catalog . . . 400 production and clamping tools for schools and industry!

WILTON

Wilton Tool Mfg. Co., Inc. • Schiller Park, Illinois

*Attach this ad to your letterhead and mail*

NEW! Evans
POWER-TAPE




**No More Pushing Blade Back Into Case!**

Here's the greatest single mechanical advance in steel tape history! Press the button gently with your thumb — blade returns smoothly. You control the speed. Release the button — blade stops instantly. No "creep," no lost measurements! Chrome-plated case. GIANT sliding end hook — for inside-outside measuring. White steel blade, marked [illegible] and fractional inches — no figuring!

Tape Holster — No Charge

*Unconditionally Guaranteed*
6, 8, 10, or 12 ft. lengths
Get POWER-TAPE *today!*
*Available only at hardware stores*

Only $1.89 (10 ft.)

Evans RULE CO., *Factories at:* Elizabeth, N.J., & Montreal, Que.

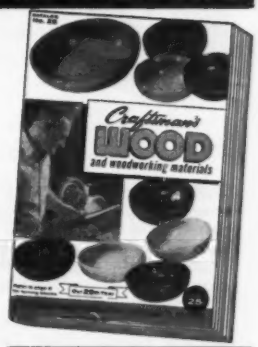
ALL NEW, COMPLETE CATALOG OF
WOOD & WOODWORKING EQUIPMENT
FREE TO INSTRUCTORS

*New 1959 Edition . . . . . .*

**Finest Domestic and Rare Woods . . Molding . . Tools . . . Imported Ceramic Tile**

**ALL AT LOWEST PRICES**

INSTRUCTORS! Just mail coupon for your FREE COPY (25c to students, refundable with first order) of our giant new 1959 woodworking catalog. We are America's largest source of fine domestic and rare imported woods for projects. Also bandings, veneers, inlays . . . all shown in full color. Includes over 250 scroll patterns. See newer tools, equipment and hard-to-find cabinet hardware. Rush your request today!




**CRAFTSMAN WOOD SERVICE CO.**
2729 Mary St., Dept. K-2, Chicago 8, Ill.

CRAFTSMAN WOOD SERVICE COMPANY
2729 Mary St., Dept. K-2, Chicago 8, Ill.

Instructors: Send new WOODWORKER'S HANDBOOK—FREE (enclose 25c if student, refundable with your first order).

Name _____

Address _____

City _____ Zone _____ State _____

- 132 PAGES . . . many in full color . . . newest project ideas
- Embossed mouldings, curved ornaments, matched plywoods and veneers.
- Complete lines of archery and upholstering supplies
- New! Blanks for baseball bats, snow skis, complete water ski kit.
- New! Hardware for baby cribs, typewriters, folding legs
- Many new woodworking tools
- Same day shipment; guaranteed satisfaction

*happenings in industrial education*

## Technical Training Plans

FOURTEEN states, late in December, received approval of plans and allotment of federal funds to provide training in technical skills important to national defense. Plans from 19 other states for vocational-education programs under the National Defense Education Act of 1958 are being reviewed, the U.S. Office of Education announced.

The new vocational-education programs, which are under the direction of James H. Pearson, assistant commissioner for vocational education, are designed to provide more and better trained technicians in areas essential to national defense. Courses in these technical subjects will be established for both young people and adults.

Congress authorized an appropriation of $15 million in matching funds for the current year for the programs, and appropriated $3¾ million to get them started.

The 14 states whose plans have been approved so far and the amounts allotted from the initial appropriation are: Alabama, $104,707; California, $170,450; Colorado, $31,084; Connecticut, $32,821; Florida, $55,687; Idaho, $21,879; Illinois, $156,854; Kansas, $55,375; Kentucky, $106,588; Mississippi, $99,072; Nebraska, $43,442; Oklahoma, $66,821; Wisconsin, $93,103; and Wyoming, $17,227.

The federal funds may be used by technical high schools to expand their programs or to add night classes, or by secondary schools to add either day or evening technical courses to their regular curriculums. The new law encourages states and local districts to cut across school boundary lines so that no student who could profit from the new technical training will be prevented from enrolling because of the location of his residence.

## Start State-Wide Study

A TWO-YEAR study of vocational and technical education in Illinois schools has been started by the University of Illinois Bureau of Educational Research for the Office of the State Superintendent of Public Instruction.

A staff of University specialists is working with William P. McLure, director of the Bureau, on the project. The study, which will be conducted at both high-school and adult levels, will review the entire vocational-technical program as to nature of activities, their organization, and financing.

Professor McLure states that this is the first comprehensive study of these activities on a state-wide basis in many years.

## Negligence Charged

FAILURE of a California school district to have a guard on a printing press on which a student was injured was a violation of the State Safety Orders and was evidence of negligence on the part of the district, according to a recent decision of a California Appelate Court.

The court stated, "We conceive of no reason, founded on the evidence before us . . . that violation of the safety regulations could be found to have been justified, excusable, or consistent with the exercise of due care."

The State Safety Orders, as a result of this decision, now have been determined to apply to instruction of pupils as well as to the safety of employes and the general public. The school district was held liable for damages.

## Apprentice Contests

EARLY indications are that a record number of entries will be competing in the 1959 annual apprentice contests in


SHELDON

*Builder of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes*

**It only takes one good Milling Machine and a capable Shaper to triple the value of your shop course**

No course in shop practice can be complete without basic instruction on the milling machine and the shaper.

For this no other units equal the size "0" Sheldon Milling Machine with its hand and power table feed, quick-change gear box, variable speed drive, back geared unit, and interchangeable vertical milling head attachment. No other shaper is better suited for class work than the ample size Sheldon 12" Back Geared Shaper with its large capacity, long stroke, variable speed drive, weight and accuracy.

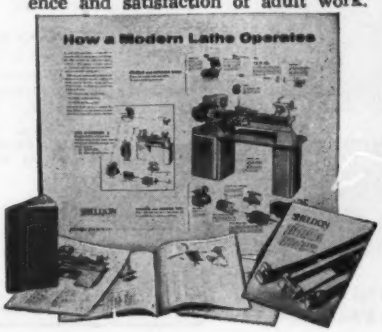
These are standard machine tools with which you can teach modern methods and tool performance—— full powered industrial tools that can give your students the "feel" experience and satisfaction of adult work.

Sheldon provides today's modern school shop with "up-to-date" machine tools . . . with 10", 11", and 13" Precision lathes for both industrial arts and vocational programs . . . Sheldon Milling Machines . . . Sheldon Shapers . . . and, for advanced courses, Sebastian 13" and 15" Geared Head Lathes.

**BASIC TEACHING AIDS**

In addition to providing conveniently located distributors with experienced sales engineers, Sheldon prepares and publishes basic teaching aids, for shop instructors.

Write for samples today——




**SHELDON MACHINE CO., INC.**
**4260 N. Knox Ave., Chicago 41, Ill.**

the patternmaking and foundry trades, the American Foundrymen's Society, sponsor of the competition, announces. In 1958 a record number of 600 entries were received in the competitions. The contests have been held since 1924.

### Texas School Expansion

LAMAR State College of Technology, Beaumont, Tex., announces that its School of Vocations will be in three new buildings, now under construction, at the beginning of the 1959 fall semester.

The buildings, located on an 8.2-acre tract, will include 33,000 square feet of floor space. They will be completely air conditioned and equipped with the best modern facilities, according to F. L. McDonald, president of the college. The School of Vocations, which provides trade and technical education, is now in its 35th year.

### School Name Changed

THE Chicago Board of Education has changed the name of the Washburne Vocational High School to the Edwin Gilbert Cooley Vocational High School. The name of the Elihu Benjamin Washburne Trade School was transferred to a building at 3233 W. 31st St. in Chicago.

### Virginia Officers

JOSEPH SCHAD has been elected president of the Virginia Industrial Arts Association for the coming year. John Esterly and Frank West have been named vice-presidents, and Virgil Harris is secretary-treasurer.

### New IE Building

THE industrial-education department at Indiana State Teachers College, Terre Haute, has recently moved into a remodeled building.

Important features include a discussion center on each floor, an exhaust system connected to most machines, compressed air outlets in every shop, and display cases on each floor.

The handicraft shop, metal shop, and storerooms are located on the first floor. Drafting room and wood shops are on the second floor. A model general shop, an electronics shop, and a large conference suite are on the third floor.

The power and auto-mechanics shop and the graphic-arts shop are in a one-story annex, built in 1956.

### Texas Study Under Way

A PROGRAM establishing a commission to study vocational education and industrial arts in Texas has been announced by J. W. Edgar, state commissioner of education.

We've taken our popular Model 49A . . . put it on heavy duty, rubber tired, ball bearing wheels . . . added a smooth one piece fold-down handle. Here's a metal cutting band saw that's **REALLY MOBILE** . . . that can be wheeled wherever needed . . . quickly . . . easily.

The Wells Model 49A is a dual purpose saw. As a horizontal cut-off machine, it has a capacity of 3½" x 6". Swing the head into vertical position . . . it becomes an upright band saw for cutting angles, slots, notches, bevels and contour work.

The 49A is a natural for the school shop, providing efficient and easy student operation. The 49A fits the budget, too. Low initial cost . . . low operating cost . . . but high in performance. Ask your local Wells Distributor for full details . . . or write for Bulletin 253-H.

Wells Saws
Wells®

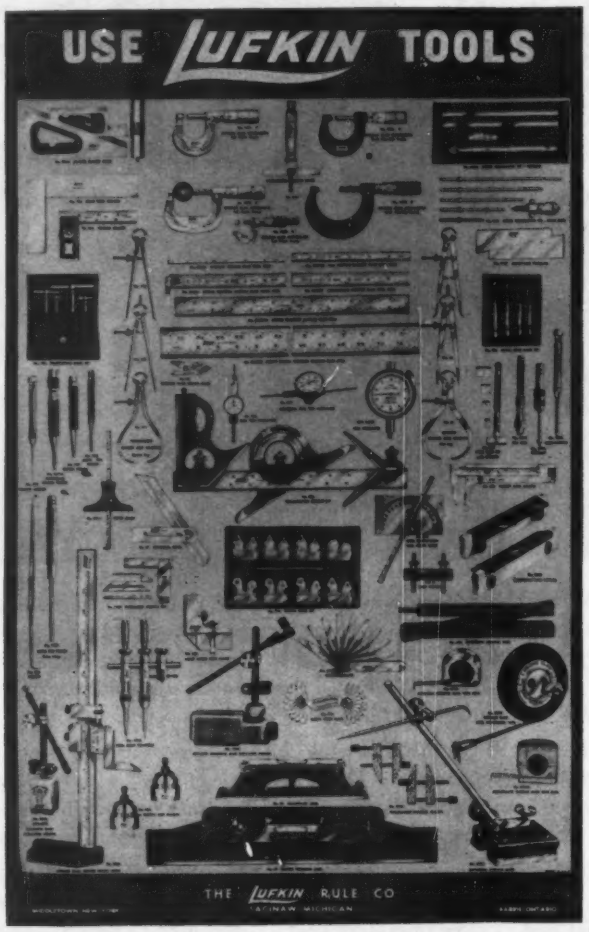
*The Pioneers of Horizontal*
**METAL CUTTING BAND SAWS**
**WELLS MANUFACTURING CORPORATION**
2600 SHOP AVENUE THREE RIVERS, MICHIGAN

The commission, which is composed of representative high-school teachers and principals, superintendents, school-board members, and college teachers and officials, will: recommend standards for the program, formulate statements concerning the place of vocational education and industrial arts in the curriculum, review the legal framework for the program, determine whether the present program should be revised, recommend improvements needed—if any—in teacher-education, make recommendations concerning textbooks and instructional materials, and study the relationship between vocational education and industrial arts in Texas schools.

### North Carolina Meeting

KERMIT SEEFELD, president of the American Industrial Arts Association and chairman of the department of industrial arts at Santa Barbara College, University of California, was the principal speaker at the meeting of the North Carolina Industrial Arts Association, Nov. 1 in Goldsboro. His topic was "Industrial Arts in a New Era."

The largest number of industrial-arts teachers in the 10-year-old history of the organization attended the fall meeting. The Association will sponsor its eighth annual project fair in Raleigh on May 1-2.


Send me the colorful, new 1959 LUFKIN tool chart

Name_____

School_____

Address_____

City_____ Zone_____ State_____

Mail Coupon to: THE LUFKIN RULE COMPANY • Saginaw, Mich.


### New England Association

"INDUSTRIAL Arts and the Total Curriculum" was the theme of the 21st annual convention of the New England Industrial Arts Teachers Association, held Nov. 14-15 in Portland. The principal address was given by G. Harold Silvius, chairman of industrial education at Wayne State University, Detroit, Mich.

Kenneth E. Webber of Maine was elected president of the Association for 1959. Other officers elected were: vice-president—G. Wesley Ketcham, Connecticut; secretary—Edward P. Stach, Connecticut; treasurer—H. Ward Manghue, Massachusetts; and state chairmen—John F. Fabian III, Connecticut; Neal D. Gadwan, New Hampshire; Robert Howe, Vermont; Edmund Medeiros, Rhode Island; Joseph A. Chicetti, Massachusetts; and Robert Taylor, Maine.

The 1959 convention will be held in Connecticut.

### Adds IA Course

SACRAMENTO State College, Calif., last fall made its initial venture in the field of industrial-arts education when it offered an advanced course in techniques and methods in metalwork. Additional work is planned for the spring semester, with a six-unit full program proposed for the summer of 1959.

### Second Kentucky Conference

THE Kentucky Industrial Education Association, at its second annual conference in Louisville, Nov. 7-8, marked up a registration figure of 417 persons. The organization now has 479 members.

L. D. McDowell was elected president of the Association for the coming year. Other officers are: J. M. Moore, vice-president for industrial arts; Harold Rice, vice-president for T&I education; and Phillip C. Hampton and Dale Patrick, directors.

Speakers at the convention included Omer Carmichael, superintendent of Louisville Public Schools; Dewey F. Barich, president of Detroit Institute of Technology; Robert R. Martin, state superintendent of public instruction; and Sam Ezelle, executive secretary of Kentucky State AFL-CIO.

### New Vocational School

PLANS for a new vocational school building at Rice Lake, Wis., are now being made. The building will house four shops—cabinetmaking and woodworking, auto mechanics, welding, and

machine shop—as well as eight classrooms. It is hoped the building will be ready for occupancy this summer.

### Busy Year in New Jersey

THE New Jersey State Vocational Division assisted local superintendents of schools and architects in developing 108 new industrial-arts laboratories on the elementary, junior-high, and senior-high-school levels last year, according to a recent release in the *New Jersey Vocational Newsmagazine.*

A total of 132 industrial-arts teachers participated in professional improvement courses provided by the Vocational Division last year, covering the fields of jewelry, wrought iron, upholstery, photography, and welding.

Three state teachers colleges in New Jersey now prepare industrial-arts teachers. The new State Teachers College at Union this year accepted its first class, to join the industrial-arts teacher-training colleges at Montclair and Trenton.

### Better Paid

INDUSTRIAL-ARTS teachers in Ohio receive more money than science teachers, according to a recent study by Edward R. Towers and Willis E. Ray of the college of education at Ohio State University, Columbus.

The study, reported in a current issue of *Ohio Schools,* shows that industrial-arts teachers enjoy a higher median salary per year than other teachers. In many cases, of course, the study points out, the additional money is the result of extra work in administration, coaching, or other activities. The law of supply and demand is also at work, the study says, since industrial arts is listed by the Ohio State Department of Education as one of the two fields at the secondary level with the greatest shortage of teachers.

The study also shows that schools organized on the senior-high plan offer better salaries to industrial-arts teachers than do schools organized along other plans. And teachers of industrial-arts in the cities generally receive higher salaries than those teaching in the county systems.

### Date Changed

THE University of Michigan announces that the seventh annual Institutes for Drafting and Machine Shop Teachers, originally scheduled to be held in Ann Arbor on March 28 will be held one week earlier, March 21.

### New Indiana School

CLARENCE NEEDLER is director of the vocational-education department of the new Penn Township High School, near Mishawaka, Ind., which was opened last fall. The department includes the following teachers: J. Kintzel, agriculture; K. Benning, radio and auto shops; T. Portolese, wood and general shops; J. Sands, drafting and machine shop; and M. Green, math and drafting. Mr. Needler also teaches machine shop.

### Convention Calendar

**California Industrial Education Association,** Civic Memorial Auditorium, Stockton, Mar. 13-14.
**Tennessee Vocational Association,** Nashville, Mar. 19-20.
**Illinois Vocational Association,** Hotel Pere Marquette, Peoria, Mar. 19-21.
**Ohio Industrial Arts Association,** Neil House, Columbus, Mar. 19-21.
**New Jersey Vocational and Arts Association,** Asbury Park, Mar. 19-21.
**Washington Industrial Arts Association,** Shadle Park High School, Spokane, Mar. 27-28.
**Michigan Industrial Education Society,** Pantlind Hotel, Grand Rapids, April 9-11.
**New York State Vocational and Practical Arts Association,** Hotel New Yorker, New York, April 16-18.
**West Virginia Vocational Association,** Jackson's Mill, April 17-18.
**American Industrial Arts Association,** Long Beach, Calif., April 22-26.


*The More You Know About Saws,*
*The More You'll Appreciate the New*

**BOICE-CRANE CHALLENGER**

**10" TILT-ARBOR SAW**

NEW! Rising standard motors, drive system simplified, all rolling-sliding pulleys, provides constant belt tension. Reduced vibration and belt distortion. Fool-proof.
NEW! 10" blades retract fully below table without added tension loads on belt or bearings.
NEW! Ripping gauges improved and trouble-proofed. New auto-positive clamping maintains split-hair accuracy.
NEW! Entire under carriage from trunnion to saw-arbor housing, re-engineered for added strength, bigger shock loads, stepped-up power from larger motors.

*A high quality, but really low-priced, precision circular saw.*

- Full-floating, frictionless, rolling-motor drive gets all the power to the blade, and reduces belt wear and vibration to a minimum.
- More capacity to the gauges.
- Brawn aplenty for heavy overload. Oversize bearings, arbor, trunnions and undercarriage.

*Write for catalog and prices.*

**BOICE-CRANE COMPANY**

**938 Central Avenue** • **Toledo 6, Ohio**

# Diamond Dust

**Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.**

## Willie Watches Out

WILLIE WATSON was a bright boy, who had just graduated from high school. He had done quite well in his school studies, and he was outstanding in his science and mathematics classes. In view of his record in high school, his teachers and the school counselor urged him to enter engineering college and prepare himself to enter that field as a graduate engineer. However, Willie had ideas of his own about his future and spending four years in college was not included in them.

He knew that he might elect a post-graduate course in machine shop, and prepare himself for the field of tool-and-die making, where his knowledge of mathematics and science would be a distinct asset. However, Willie was rather fussy about his personal appearance, and he disliked the idea of working on what he had come to believe was a dirty job.

During his senior year in high school he had visited several different industries, and he had been impressed by the research laboratories being maintained in them. In one of these laboratories investigations were being conducted on papermaking. In another, experiments were being carried on in regard to the reaction of drugs. And in still another the members of the staff were studying the efficiency of automotive power units.

During these visits Willie discovered that only a few of the employes in the laboratories were fully qualified engineers. As a matter of fact most of them were individuals who had a good foundation in science and mathematics; they had a keen appreciation of precise measurement; and they had a profound interest in exploring the unknown. These individuals had not completed the requirements for an engineering degree, but they had acquired a knowledge of the basic elements on which the engineering profession is built. He discovered, too, that in order to distinguish them from the graduate engineer they had come to be known as "Technicians."

As Willie reflected on his observations during these visits, he concluded that this was an area of employment in which he might be interested. When he inquired about the method of entering the field, his counselor suggested that he enrol in a post-high-school two-year course in the local junior college. With this in mind he appeared at the college at the time of registration. When he inquired about the courses he was informed that what was offered was merely the first two years of a four-year literary or engineering college course. While he realized that this was good, he felt that it was not designed to lead him toward the goal he had in mind.

On further investigation Willie learned that, in a neighboring town, special courses were being offered which were designed for the training of technicians. When he visited the school, he found that there were others who were planning on becoming technicians, but not all of them were aiming at the same area of specialization. Some wished to find employment in the medical field, others hoped to work in a dental office, while still others were interested in electronics. Only a few had a common interest, with Willie, in the industrial field. And the boy wondered what kind of

from
STACOR
...new functional units
for your school
THE FLEX-MASTER MULTI-STUDENT
LIFETIME QUALITY
INDIVIDUALIZED DRAWING UNIT DU-1200
provides horizonal board storage facilities for 12 students
• Efficient • Space-saving
• Economical • Private
Drawers have individual locks, masterkeyed . . . hold boards up to 20x26 in a horizontal position plus tools, other material.
for 10 students the DU-1000
for 9 students the DU-900
for 7 students the DU-700
for 6 students the DU-600
6-drawer cabinet unit the DU-600
5-drawer cabinet unit the DU-500
free-standing unit for 12 the NL-1200
Also available free-standing unit for 6 the NL-600
Write TODAY for complete NEW catalog. Dealer inquiries invited.
Manufacturers of Lifetime Quality School, Drafting & Library Equipment
STACOR EQUIPMENT CO.
271 Emmet Street, Newark 5, New Jersey • Bigelow 2-6600
Since 1932

course was being offered that would meet the needs of several groups, each one with a different interest.

However, when the class assignments were made, Willie found that, instead of attempting to train all pupils in one group, a special course was provided for each field of interest. One group might go deeply into mathematics, while another might study only the fundamentals. The application of the principles of science to the problems encountered in one field might differ greatly from a similar application in another field. Apparently the school authorities had recognized that, while some subjects might be studied by all, the extent to which it would be studied, and the problems to which it would be applied might be entirely different.

These differences suggest that each area for which training is to be provided must be analyzed to determine the specific skills and knowledge needed by the technicians in it. Then, on the basis of the analysis, a course of study should be prepared for that group. If this course is to be effective, it is imperative that we gain the cooperation and confidence of those who are in a position to hire the students after they are trained. These individuals must be given an opportunity to indicate specifically what they expect the technicians to know and to be able to do.

If we are to be successful in this relatively new venture in education we must carefully avoid generalities, and we must keep constantly in mind that we are training individuals for specific fields of employment. Anything that promotes this objective is good. If we falter, and attempt to satisfy the many who pretend to keep education respectable by having their school accredited by a higher institution, we are lost. On the other hand if we adhere rigidly to the thought that we are training young people for specific jobs as technicians, Willie's ambition will be fulfilled, and his enthusiasm will filter down to the many young people who will follow him. ★

**"Jeans" Meet** . . . . . *from page* 13

foundry for light work. We have a well-equipped ceramics shop, too. And, our graphic-arts shop is equipped with power letter presses, hand and proof presses, a selection of type, two darkrooms, and blueprinting equipment.

In the electric shop we have facilities for wiring, lamp making, electronics projects, coil winding, and experimenting.

You can appreciate, therefore, the fact that this is no watered-down attempt merely to be efficient about our educational offerings in industrial arts for boys and girls. We have the equipment, we have the system, and we have the knowledge now that we have hold of something real good, real valid: Industrial arts is part of youngsters' whole education, not merely some place where certain young people, with seeming lacks of talents and abilities, are dispatched as they wait their opportunity to leave school. ★

"...the most diversified and complete line of benches in the field"

Hard Maple Bench Tops
Laminated edge grain hard maple 2¼" thick can be made to any size.
Double Door Base
L5A Locker Base (locker openings 18" x 10" x 21")
L5 Locker Base (locker openings 12" x 15" x 21")
Sliding Door Base
Sliding Drawer Base

...that's what they say about B-G

**AND THE REASON** is partly apparent above, where you see just some of the many individual units that make up the B-G bench line.

**B-G BENCH LINE INCLUDES:**

| | |
|---|---|
| Woodworking Benches | Stain Benches |
| Sheet Metal Benches | Craft Benches |
| Welding Benches | Drawing Tables |
| Electrical Benches | Planning Tables |
| Automotive Benches | Storage Racks |
| Gluing Benches | Cabinets |

**BECAUSE OF THE** tremendous number of combinations possible with B-G bases and tops, it is an easy matter to have B-G solve your bench problems to your complete satisfaction, even getting the most efficient use out of "awkward space"—yet at no extra cost.

**CALL ON B-G** for all your bench problems. Write Dept. 19 for complete bench literature, and if necessary we'll have our area representative make a personal call and get a first hand picture of your requirements.

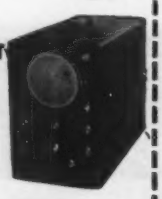
BRODHEAD-GARRETT CO.
4560 East 71 St., Cleveland 5, Ohio

# Heathkits PROVIDE "LEARN-BY-DOING" EXPERIENCE
IN THE CLASSROOM AND SHOP

**Heathkit BROADCAST BAND RECEIVER KIT**
Covers 550 to 1600 kc and features miniature tubes, 5½" PM speaker, and built-in antenna. Cabinet available.
MODEL BR-2 *incl. fed.* $19.95
Ship. Wt. 10 lbs. *excise tax*
(Less Cabinet)

**Heathkit VACUUM TUBE VOLTMETER KIT**
Features 7 DC ranges, 7 AC (RMS and peak-to-peak) ranges, and 7 ohmmeter ranges. 4½" 200 ua meter—11 megohm input impedance—1% resistors—etched-metal circuit board—attractive styling.
MODEL V-7A $24.50
Ship. Wt. 7 lbs.

**Heathkit ETCHED CIRCUIT *New* OSCILLOSCOPE KIT**
Full 5" oscilloscope using etched metal circuit boards. Ideal for classroom construction and demonstration. Features extended sweep range and broad amplifier response. Push-pull vertical and horizontal amplifiers. A tremendous dollar value.
MODEL OM-2 $42.50
Shpg. Wt. 21 Lbs.



Heathkit manuals provide step-by-step assembly instructions, pictorial diagrams, schematic diagrams, information on color codes, on soldering, and regarding tools. High quality parts supplied in every kit.

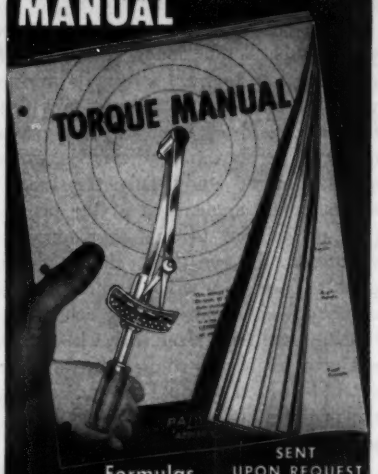
Deal directly with the manufacturer for reliable, professional-type equipment at budget prices. Employ Heathkits in your training program—the world's finest electronic equipment in kit form.

**WRITE FOR *Free* CATALOG**
Describes more than 65 interesting "build-it-yourself" projects. Amateur equipment, hi-fi amplifiers, and the complete Heathkit line of test instruments. Get yours today!

**HEATH COMPANY**
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 30, MICHIGAN



# "TORQUE WRENCH" MANUAL




SENT UPON REQUEST

Formulas
Applications
Engineering Data
Screw Torque Data
Adapter Problems
General Principles

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS
Manufacturers of over 85% of the torque wrenches used in industry

## WELDING FUME Collector!

Here's a practical unit for removing heat, smoke and gas fumes created by arc or gas welding. Hood operates on a 3 ft. radius, with 2 ft. vertical adjustment. Units can be installed singly, or several welding tables can be equipped and operated from one central fan installation.

• • •

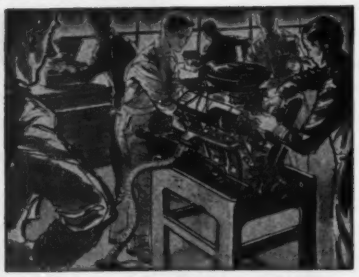
Every school welding shop should be equipped with this SAFETY DEVICE.

*Write for Bulletin No. 37-S*

**RUEMELIN MFG. CO.**
3868 No. Palmer St. Milwaukee 12, Wis.



# Keep Sickening Exhaust Gases Out Of Your School Shop



NATIONAL Systems remove poisonous carbon monoxide gas right at the source . . . the exhaust pipe . . . and carry it to the outside without heat loss in your shop. No rearrangement of your present shop layout necessary. Choice of 6 overhead or underfloor systems, which can be engineered to each individual application using standard "packaged" kits, including motor, blower, ducting, flexible tubing, etc., ready to install. Tell your architect or write for literature.

*National* SYSTEM
OF GARAGE VENTILATION, INC.
143 W. William Street Decatur, Illinois



before you order . . .

WRITE FOR YOUR COPY OF

# HUTHER BROS.
## Wood Saw Catalog WS 300

SAW MAKERS FOR OVER 70 YEARS

Profusely Illustrated . . . Highly Instructive . . . Conveniently Indexed . . . 24 Pages . . . 8½"x11" . . . Punched for 3-Ring Binder.

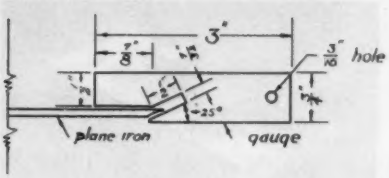
The culmination of over 70 years' experience in manufacturing the finest WOOD SAWS available. A reference MUST for the discriminating SHOP INSTRUCTOR.

WRITE TO DEPT. SS
**Huther Bros. Saw Mfg. Co., Inc.**
1290 University Avenue • Rochester 7, N. Y.

# KINKS

Payment will be made for each Kink published. Send to Editor, School Shop, Ann Arbor, Mich.

## Redesigned Bevel Gage




The above drawing illustrates what I think is an improvement in the design of the standard-bevel grinding gage for chisels and plane irons. In its present design it is impossible to use the gage, because of its length, to check the 25° angle while the chisel or plane iron is still in the attachment and make the necessary adjustments to produce the correct bevel. The above gage can be made quite simply by using 1/16" mild steel.—*Worsley Fardy, Maynard, Mass., High School.*

## "Clip" the Brush

In our classes where a container of finish (types where evaporation is slow) is being used by several students at different intervals during the finishing stages, we have discovered that using two "Bull Dog" (spring) clips permits a quick and easy method of suspending the brush to the correct depth in the finish vehicle. This technique eliminates mess, the problem of containing the brush in the proper solvent, and errors in using the wrong brush for the wrong finish.—*Anton J. Netherda, Jr., Nebraska State Teachers College, Wayne.*

## Send in Your Kinks!

Your colleagues are always looking for new, different, and better ways to do certain jobs in their shops. If you have a special way of doing something in your wood, machine, metal, crafts, forge, paint shop, drafting room, etc., send it to SCHOOL SHOP, 330 Thompson Street, Ann Arbor, Michigan. Payment will be made for each Kink published. Please enclose a good drawing or photograph with each Kink.

## Use a Tea Cup

Porcelain crucibles are a necessity for heating brass or silver for small castings. However, they are fragile and easily broken and expensive. An excellent substitute in an emergency is a common tea cup. A discarded one with a broken handle will do. It is best to set the cup in a steel ladle before using. About one-fourth to one-half inch of the rim of the cup snaps off when heated due to the moisture which is trapped in the sides of the cup by a seal of glaze on the top of the rim. This improvised crucible will withstand temperatures up to 2000°F and over. Return it to the hot furnace to cool after pouring.—*Louis Enos, Lincoln Junior-High School, Sacramento, Calif.*

## A Solution for Solvents

Stoddard solvent, a petroleum distillate, can be had with flash points ranging from 105° to 180°. We use the solvent with a range of 140°-145° for thinning, brush cleaning, and removing grease spots from clothes.

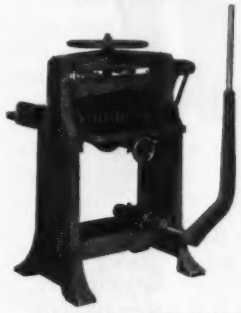
It is safer and a better cleaning solvent than kerosene or gasoline. It is also less toxic, has less sulfur, and less odor.


**There's a C&P "Value-Packed" Paper Cutter to fit school needs**

Every Chandler & Price paper cutter no matter what the size, is built to the same precision standards for accuracy in cutting, ease of operation and a lifetime of service. The C & P line includes the most complete selection of smaller cutters—automatic or hand-operated—to meet the needs of any vocational graphic arts department. You can choose a C & P cutter with full assurance it will fit your particular requirements. Compare C & P before you specify any cutter.

**HYDRAULIC CUTTERS 26½" and 30½"**
**Full Hydraulic or Hand Clamp Models**

C & P hydraulically operated cutters provide the advantages of hydraulic cutter operation at minimum investment. Bigger production with less effort for the operator is the keynote. Two operating controls require the use of both hands when making cut—safe, efficient. Features include illuminated tape magnifier and two scales inserted in table. Except for operation of clamp, both hand clamp and full hydraulic models are identical in construction.



**CRAFTSMAN 26½" LEVER CUTTER**

Where power cutting is not required the C & P 26½" lever cutter handles an astonishing amount of cutting. Every feature of construction aids the operator. The knife bar linkage provides greatest possible cutting leverage. A counter weight balances the knife bar and keeps the knife from falling. Cut can be accomplished without undue reaching or stooping.

**C&P BENCH CUTTER**

This cutter is designed for installation on bench or cabinet. The knife cannot fall accidentally nor cutting handle be pulled down until safety lock is held open by operator's left hand at start of each cut. The cabinet is optional equipment. Two sizes: 19½" and 23". Cuts and trims sheets up to 19" x 24" or 23" x 24".

THE CHANDLER AND PRICE COMPANY
6000 Carnegie Avenue • Cleveland 3, Ohio
Manufacturers of dependable printing presses and paper cutters

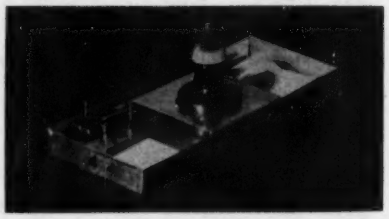
Its distillation range, too, is about 40° while kerosene's range runs as high as 200°-225°. In addition, while kerosene has a legal minimum flash point of 120°F, Stoddard 140 may often be used where fire regulations prohibit the use of kerosene as a cleaning agent. Added features of Stoddard, such as the fact that it dries faster than kerosene and doesn't leave an oily surface, compensate for the extra cost of a mineral spirit over kerosene. Under any circumstances it is wise to check with local fire regulation officers before purchasing large quantities of any kind of solvent.—*James E. Bowman, Central Michigan College, Mt. Pleasant.*

### A Swish and It's Done

Try the "swish method" for keeping brushes shining like new. Take two good-sized tin cans. Label one of them "Solvent, Swish Can #1" and partly fill it with the proper solvent for the finishing material being used in the shop. Label the second can "Cleaner, Swish Can #2" and partially fill it with warm water and add one-half cup of detergent.

When a brush is ready for cleaning, swish it first in the #1 can, squeeze out the cleaning solution, then give it a swish in can #2. Hang the brush up to dry and that's all there's to it.—*Charles M. Rice, Western Washington College, Bellingham.*

### Neat and Tidy



Whenever a student is ready to ink, he is given one of the above trays which contain a ruling pen, a freehand pen, a pen-wiping cloth, a small piece of blotter, and the bottle of ink. The tray is made of sheet metal and can be washed under a faucet whenever it becomes too coated with ink. The measurements we used are ¾" x 3½" x 8".

We have found this tray to be the answer to a major housekeeping problem in our drafting room.—*Bob Reeves, Chula Vista, Calif., Junior-High School.*

### Increase Screwdriver Lifetime

We decided that we were spending too much money on screwdrivers in our electrical shop. The wooden handles just did not stand up. To correct this, we did the following:

We bought 9 feet of 1", fluted, Tenite plastic rod. Our machine shop cut the Tenite into 4" lengths, grooved one end for gripping, and rounded off the other end. Then they drilled the grooved ends 2" or 3" deep.

We had saved all of the screwdriver shanks over the past few years and the boys made cross-file marks on them. The holes drilled in the plastic were about .001" smaller than the shank.

The plastic was heated, the shanks forced in the soft plastic, and allowed to set. We now have 15 insulated-handled screwdrivers, better than our old ones. Cost: About 20 cents apiece.—*Louis Cenci, McKee Vocational and Technical High School, Staten Island, N.Y.*

### Speeds Identification

We have carried color-coding into our drafting room to speed-up identifying three grades of pencils that we use. They are: 2H is blue, 3H is yellow, 5H is green. This plans works well for us. Unless you have color-blind students it should work for you, too.—*F. D. Conrad, Webster Groves, Mo., High School.* ★


THE PERFECT SAW FOR ANY SCHOOL SHOP!

Johnson model B

Metal Cutting Band Saw (Wet or Dry)

FEATURES

- Large Capacity
- Portability
- Light Weight
- 3-Point Suspension
- Operational Safety
- Centralized Controls
- Speed and Accuracy
- Lowest Cost

The Johnson Model B . . . the only light and semi-portable metal cutting band saw with wide-range heavy duty capacity. The versatile Model B is fast—accurate and *economical,* it easily handles 5" rounds and 10" flats with automatic precision. It's available in the standard Dry or Wet model to suit the need and can be caster equipped for portability. See for yourself, why Johnson Saws are preferred for school shop use. Write today for catalog and new low school shop prices.

NOW... Each Model B equipped with exclusive School Shop Safety Guard—cost free!

Johnson MANUFACTURING CORPORATION

Albion, Michigan

## *Here Is a Way . . .*

### to publicize your industrial-education program

#### They Made Toys for the Needy

The Central District Industrial Arts Association of Arizona made toys for needy youngsters last Christmas. The facilities of the Arizona State College industrial-arts department were used. The Camelback, Ariz., high-school shop facilities were also offered for this project.

#### Drafting Contest Stirs Interest in the Field

A recent contest in drafting sponsored by industry in the Glendale, Calif., school district aroused considerable interest in the field. The contest was held at Glendale College.

There were six prizes, in all, in the junior and senior divisions. First prizes in both divisions were jobs at two sponsoring firms.

All drafting students were eligible to submit a portfolio of their work to a committee made up of school people. Although only two jobs were offered as prizes, industry was enough impressed to offer *all* finalists employment.

#### Model Home Publicizes Class

Probably one of the best publicized classes in Pasadena City College, Calif., is the building construction class. This is due to the fact that each year the class designs and builds a model home and opens it to the public, attracting large crowds.

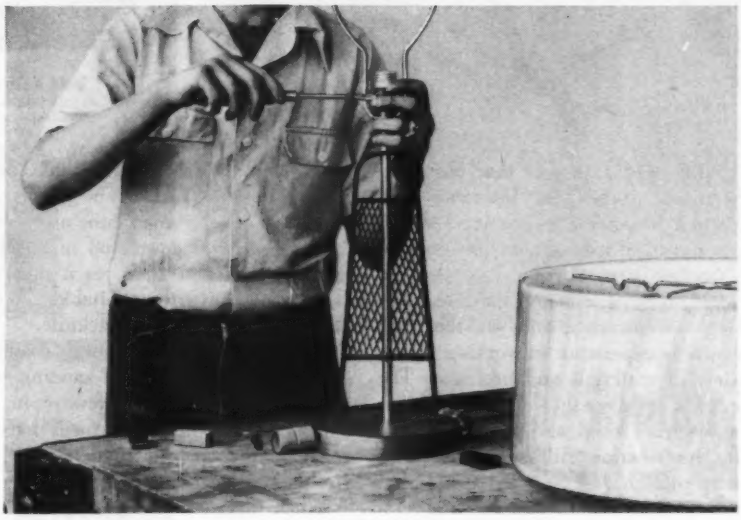
The project is called one of the best examples of campus-community-district-industry cooperation. It represents a coordinated effort of educators, builders, and labor. The objective of the building construction class is to prepare students for employment in building. The class is conducted as an actual construction job in industry, with student superintendents, foremen, and leadmen.

Students from 12 other classes in the community college also take part in the project, including the office-experience class, printing classes, architectural landscaping, architectural-specification writing class, and industrial-electricity class.

The 1958 model home was the ninth one built and exhibited by the class.

"THIS IS THE ORBITAL SANDER."


## This lamp-making project
# teaches two lessons



How to make a lamp is just one of the things students learn from this project. . . . Another is how to make a lamp that is also an *efficient lighting instrument*. Such a lamp must be designed with the user and the use in mind, so that it provides sufficient, glare-free light, properly distributed, for the user's needs.

For instance, to make a *table* lamp that does an effective lighting job, you will find this simple equation valuable:

From the average eye-level height of a seated person (40"), subtract the average end table's height (24"). The difference — 15" — is about what this lamp should measure from the table to shade bottom.

This and other valuable lamp-making facts are part of the program, "Working with Light." This program —which helps you teach "the facts of light"— was prepared by the Better Light Better Sight Bureau after consultation with representatives of the National Education Association and others prominent in the field of industrial arts and vocational education. Specially designed for high school and junior high school industrial arts classes, this program includes a 116-page Lighting Handbook, 12 Project Leaflets and a student Reference Folder.

**FREE AIDS.** A complete package of "Working with Light" materials will be sent to shop teachers *without charge* in areas where there is a Better Light Better Sight Bureau sponsor. (We will check our sponsor list for your area.) To get your materials, fill in and mail the coupon *today*.

**Better Light Better Sight Bureau, Dept. IA-s**
**P.O. Box 1647, Grand Central Station, New York 17, N.Y.**
Please send me free "Working with Light" teaching aids.
I teach in: Jr. High ☐ High School ☐ College ☐
I am a: College Student ☐ Other _____
*My Name* (TYPE OR PRINT) _____
*School* _____
*School Address* _____
*City* _____ *County* _____ *State* _____
*Electric Co. Serving School* _____

Boys need not be baited to make these

# Fishing Lures

*By Bob Reeves*
Chula Vista, California, Junior-High School

Lures made of metal and plastic, such as the above, are appropriate projects for you to consider for your students for the spring months ahead.

IF you need a project that has sure-fire student interest, just introduce your class to a few of the fishing lures shown here. Boys and fishing gear just seem to go together naturally.

Most students will find the lures easy enough to construct, and yet, they will be gaining experience in working with a variety of materials and processes. The plugs and spinners shown are a combination of metal, wood, and plastics. With a little imagination still more materials can be combined.

While plans are shown here for several basic types of lures, these plans should only serve to get students started. Have them make one or two of these and then let them use their imaginations in developing their personal special varieties. Who can say which particular combination will have the most "fish-appeal"?

Except for one plastic plug, all others are made of wood. Any fine-grain wood will serve but hardwoods will take more banging against rocks. The bodies can all be turned on a wood lathe or you can chuck a piece of dowel rod in the drill press and file it to shape as it revolves. If these methods are not suitable, you can always use a good sharp jacknife.

Apply a finish of several coats of enamel after shaping and sanding properly. If you insert a screweye in the end before finishing you will have a convenient device for hanging up the freshly painted plug.

When the enamel is dry you can add the metal fittings. Before you turn in the metal screweyes that will hold the hooks, open the eyes with a pair of pliers to allow the hooks to be inserted later. The no. 2 treble hooks, for sake of safety, should not be attached until the project has been completed and is ready to take home. The metal nosepiece which fits on the wiggling plug can be cut from tinplate or thin-gage stainless steel. Bend it to shape and attach it with small brass wood screws.

The plastic plug is made from ½" acrylic rod. Shape it as you would a wooden plug. In order to bend it, heat the whole piece until it is pliable. (Cotton gloves should be worn for protection from the heat.) Bend the plug to shape with your fingers.

You can leave the plastic surface with a sanded smoothness or you can buff it to a polished transparency. Now you can color it with transparent dyes or you can paint on a variety of designs with colored lacquer.

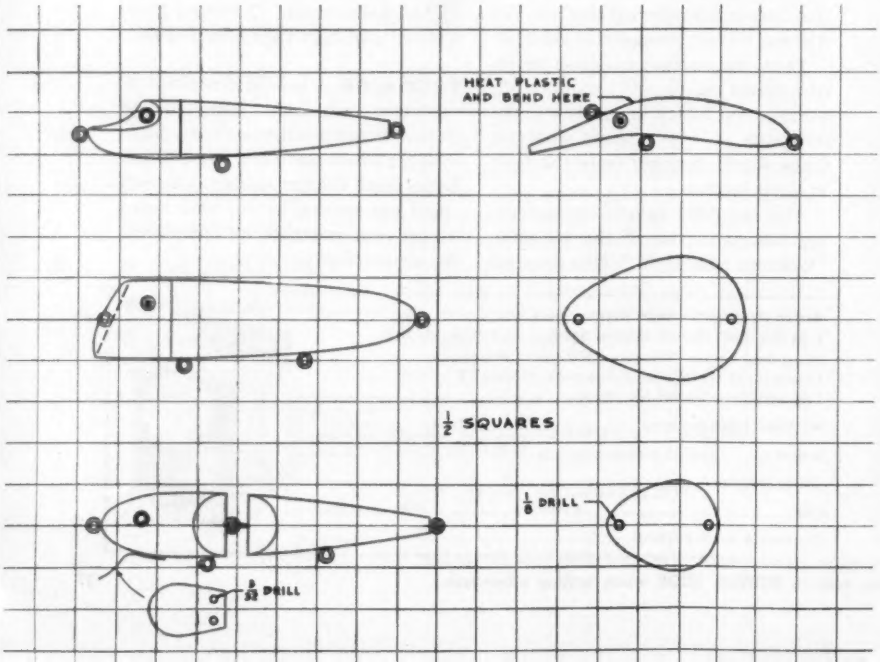
In order to attach a screweye to the plastic, hold it with pliers while you heat it until it turns red. Then push it into the plastic and hold it until the plastic cools and hardens around it.

The spinners can be made from a number of different metals, but nickel silver, about 20 gage, works very well. Cut the metal to shape and drill the holes.

The cupped shape of the spinner is formed by first pounding a depression in a block of soft wood with a ball-peen hammer. Lay the metal over the depression and pound it into shape with a rounded wooden, plastic, or rawhide mallet.

The spinners can be completed by forming a ring of stiff piano wire. Insert the hook and the spinner into the ring as a final step.

Don't let the plans shown here be your sole guide and inspiration. Take a look at some of the fishing gear catalogs. The mail-order companies will be glad to send you one of theirs if you write to them. Most important, let students use their imaginations and develop some new and perhaps entirely different devices for tempting fish. ★



New processes,
new surfaces . . .
...New Inks!

You have been using Higgins American Waterproof India Ink (4415) on absorbent tracing cloth. Now the water repellent surfaces of new cloths and foils require inks which work with all of your instruments on these new surfaces.

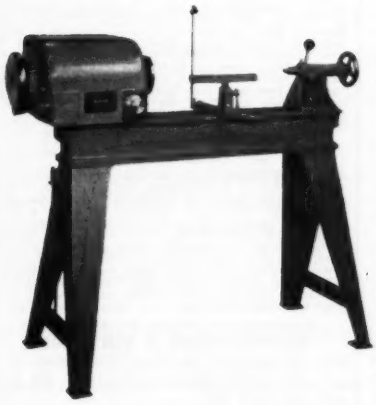
HIGGINS
supplies this need with . . .

4425
Non-Waterproof Black
Removable from plastic film by water.

4435
Waterproof Acetate Black
Waterproof on plastic film and water-repellent drafting surfaces.

*The basic art medium since 1880*
HIGGINS INK CO., INC. *Brooklyn, N.Y.*

# Watch a boy's eyes when he works on a new Oliver Lathe!



They'll sparkle with intense interest. And he will thrill to its smooth flow of power assuring fine wood turnings. Motor headstock of No. 51 Lathe has four speeds: 600, 1200, 1800, 3600 r.p.m. Hand dial controls speeds. Four-speed motor is fully protected. Has 48-inch bed—longer if desired. Turns 24" between centers, 12" diameter. Safe and easy to run. And it's built to give years and years of reliable service. Write for Bulletin No. 51.

Oliver makes two other Speed Lathes for school shops. Also a full line of heavy-type woodworking machines.

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

# SKIL 4" Belt Sander makes it easy...

## for even young students to turn out beautiful work

■ You will find that your students will turn out professional quality work with this small, lightweight and compact Skil Belt Sander. Even younger students achieve a high degree of proficiency quickly because the Skil Belt Sander is so easy to use.

■ The Model 805 Belt Sander has an exclusive 2-speed feature for fine and coarse work.

■ Because of its rugged construction, many schools put the Model 805 to work on maintenance jobs, too! **Only $94.50!**

SKIL

Famous SKIL and SKILSAW products, made only by SKIL Corporation, 5033 Elston Avenue, Chicago 30, Ill.

*another Skil basic school shop tool*

# PRACTICAL TEACHING AID

## JOHNSON NO. 133 FORGE FURNACE

**Efficient • Dependable Economical**

Burns all types of gas . . . clean and efficient. Provides high, fast heat, up to 370,000 BTUs per hour. Heavy steel construction and hard firebrick on all wearing surfaces stand up under daily, inexperienced use. Tested and approved by industrial users everywhere.

Firebox 5½" wide, 7½" deep, 27" long. Heavily insulated. Four burners. Convenient Gas and Air adjustments. Adjustable swinging refractory lid, adjustable rack, A.G.A. solenoid safety valve. Also available in smaller firebox size.

No. 133 FORGE FURNACE
$225 f.o.b. factory

WRITE FOR FREE JOHNSON CATALOG
plus information on factory reconditioning your present Johnson furnaces.

**JOHNSON GAS APPLIANCE CO.**
584 E Avenue N.W., Cedar Rapids, Iowa

*johnson*
If it burns gas look to Johnson
— Since 1901


**Supplier** ..... *from page 9)*

Another problem arose when a dealer received an order for a metalworking lathe. The type of lathe desired was clearly indicated on the order, but no mention was made of the numerous attachments to be used with it. Naturally enough, the dealer submitted his bid on the basis of the information furnished on the order. When the machine was delivered, the teacher complained that it was not complete—which was true. However, the fault could not be attributed to the dealer since he had followed the specifications to the letter. In this case, the school authorities had to pay for the attachments which made them disgruntled and caused them to view the dealer with the suspicion that he had been guilty of sharp practice. Obviously, this tended to affect adversely future business with this particular dealer, although he had followed the order correctly.

There are many other problems with which dealers are faced of which the two above are typical. If the conditions that cause these problems to arise can be eliminated, we will approach an ideal situation in which the dealer and the customer are happy.

Most dealers are anxious to provide exactly what the customer wants at a price that will permit him to stay in business. School people should extend themselves to assist the dealer in this effort to supply quality goods at a reasonable price. Among the things that schools can do to promote this end are the following:

1. Avoid writing specifications which are ambiguous. Make them specific and complete.

2. Consult with reliable dealers in regard to the specifications before requests for bids are issued.

3. If the delivery date is mentioned in the order, be absolutely sure the school will be ready to accept delivery on that date.

4. If, through no fault of the dealer, the delivery date has to be postponed, be sure he gets his money early enough to enable him to discount his bills.

5. When the school is responsible for the delay in delivery, it is reasonable to expect that any additional cost resulting from the delay will be borne by the school authorities.

6. When the installation of the equipment has to be approved by a representative of the school, it is only fair to the dealer that this be attended to promptly.

7. Any dissatisfaction on the part of the school or of the dealer affects future


## BUILD PINT-SIZE FIBERGLAS RACER BODIES TO AROUSE KING-SIZE STUDENT INTEREST!

*Quarter-Midgets for Kids!*

**Newest Sensation in Auto Racing Offers Your Plastic Craft Students the Thrill and Challenge of Designing Sleek, Scaled-Down Versions of Big Time Sprint Car Bodies—Gives Them Practical Experience in Latest Fiberglas Techniques!**

Send for FREE literature giving complete buying data on everything you need for school shop lay-ups of Fiberglas-Polyester and Epoxy Resins. It describes in detail Glass Cloth, Resins, Extenders, Catalysts, Solvents, "How-To" Books, etc. Provides basic information and procedures preparatory to undertaking track car bodies and other projects in this versatile medium such as, boats and furniture.

**SPECIAL OFFER!** Fiberglas-Polyester "COVER-IT" KIT

Contains the right amount of material for the beginner student, or to experiment with yourself. Lets you see how easy it is to repair boats, toys, lamps, furniture, etc. Complete Kit ..... $3.95
(plus 50c postage)

**Make Your Own Plastic Tool Handles with TENITE II**

**SCREW DRIVER HANDLE STOCK**

Makes tough, durable handles for screw drivers, trowels, plastic gavels, chisels, mallet heads and hand drills. The finest material made for any application that must withstand shock and abuse. Available in two styles: Fluted round type, ½" to thru 1¼" dia.; Smooth round 1", 1¼" and 1½" dia. Amber transparent color only.

**HOW TO MAKE BOWLS OUT OF FIBERGLAS CLOTH—POLYESTER RESIN**

It's easy, fascinating work. Calls for inexpensive equipment. Students can make bowls of different shapes and sizes using remnants of drapery material, dress goods, even burlap, for decorative effects. Free literature gives instructions and prices.

**ROPE THAT FLOATS!**

Made of Polyethylene and produced by the twisted-spun-laid method. It's attractive, long lasting, lightweight, dimensionally stable. Completely waterproof and buoyant. 30% lighter than natural fiber rope. Has extremely high resistance to virtually all types of acids and solvents, salt water, alcohol. It is unaffected by mold, bacteria, rot, fungi. Has excellent weathering characteristics. Does not deteriorate with age. Available in blue, yellow and white, 3/16" to ¾" dia. Ideal for water ski tow lines, lane markers for swimming pools, heaving lines and other life-saving equipment, functional and decorative applications.

**INSPIRE ARTISTIC TALENTS OF YOUR STUDENTS!**

Using ACRYLOID B-72 (a clear, syrup-like liquid that hardens to a waterproof film), you can attach thin, colorful objects on SYNSKYN (A translucent, fire-resistant Polyplastex material) to make a wide variety of unusual and breath-takingly beautiful panellings. ACRYLOID B-72 is employed both as an adhesive to hold the decorative pieces on the SYNSKYN base, and as a finish coating over the completed job. Leaves, flowers, small shells, ferns, butterflies, feathers, fishing lures, photos make perfect decorations, and the panels are ideal for folding screens, room dividers, lamp shades, sliding doors, etc.

**Build Your Own Plastic Greenhouse with POLYETHYLENE & VINYL FILM**

We have them 0.002" and thicker. Vinyl in rolls up to 6 ft. wide; Polyethylene up to 40 ft. wide. Also make a perfect moisture barrier and mulch on strawberry plant and flower beds.

**Send for FREE Price List!**

It gives helpful buying data on Plexiglas, Acetate, Castolite, Molding Powders and Presses, Cold Setting and Hot Melt Casting Resins, Plastic Foam, Vinyls, Finishing Compounds, and others. Write today!

**PLASTIC PARTS & SALES**
1157 S. Kingshighway Blvd., St. Louis 10, Mo.

transactions. As a rule, dealers are anxious to satisfy their customers and will go a long way to achieve this. School people should keep this in mind and be willing to accept a compromise that will be satisfactory to both parties.

8. Give the dealer sufficient time to make quotations on bids. A minimum of two weeks is needed by most dealers for meeting bid specifications. Oftentimes considerable checking has to be done and the dealer needs time to get the correct specifications.

9. Quite often a dealer can give a better price if bids are requested earlier in the year. Many requests for bids come in late in the school year or in the summer when dealers are busy working on summer delivery for fall semester use. By asking for bids in April, or even earlier, the work load of the dealer is more evenly distributed which is reflected oftentimes in a better price.

10. Occasionally school requirements for bonds or checks covering bids are carried to rather ridiculous extremes. With reputable dealers, bid bonds are really not needed and add one more item to the cost to be met by the dealer. They should be avoided when possible.

Competition compels the dealer to quote the lowest price that he considers to be consistent with good business and then strive to give satisfaction by supplying precisely what the customer asks for. For this reason, it is the responsibility of school authorities to make an effort to help them stay in business.

Many dealers and manufacturers make substantial contributions to the development of good programs in industrial education in the schools through the services they offer, the advice and counsel they can give because of their experience, and their knowledge of equipment and its functioning. ★

---

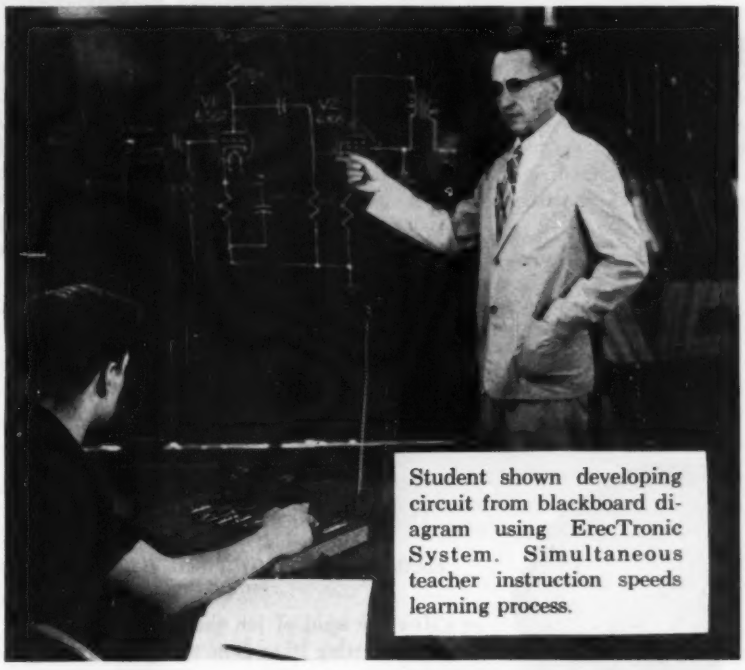
**Patterns** . . . . . *from page* 12

cloth is an old standby for the same purpose.

Some of the denser hardwoods, such as hard maple, make a very satisfactory substitute for metal patterns if they are plate mounted.

Construction of production coreboxes is as important as the pattern because they are subjected to an equal amount of use and abuse. We make a good many of our coreboxes of hard maple and often protect the strike-off edges of the box with brass or aluminum edging. In a few cases we have built metal coreboxes but usually hardwood has a long life expectancy and the working of it involves much less time and effort. ★


**NOW! from schematics to working circuits . . . in minutes**



Student shown developing circuit from blackboard diagram using ErecTronic System. Simultaneous teacher instruction speeds learning process.

**ERECTRONIC.**

**TRAINING SYSTEM**

*for teaching electricity and electronics*

This phosphor bronze Jiffy Connector from an ErecTronic Training System has made over 7,000 positive electrical connections and still retained its initial resiliency. Contact is as effective as a soldered joint.

No valuable learning time is lost in tedious soldering, mounting components, and making connections with the ErecTronic Training System. Students can build and rebuild circuits on a peg board with simple plug-in mounted components and Jiffy connectors. Used by over 500 schools and colleges in basic and advanced courses, the ErecTronic System fills both the need for classroom demonstration by the teacher and individual student use in the laboratory. The ErecTronic System presents an ideal learning situation since theory and practice can be taught together.

Developed by an educator, the ErecTronic System also provides maximum economy since all parts can be used indefinitely. The basic parts in an ErecTronic Teaching System consists of Jiffy connectors, mounted components and precision drilled Duron peg boards. Additional parts are available to suit individual requirements. *Write for free catalog.*

**SCIENCE ELECTRONICS, INC.**

195 MASSACHUSETTS AVENUE, CAMBRIDGE 39, MASS.

**Stout State College and SCHOOL SHOP invite you to**

# Join the "Design in the Shop" Program

AN invitation is extended to all interested industrial-arts teachers to participate in an interesting and practical experiment involving "design in the shop program." Its purpose is to develop a greater understanding of the practical aspects of working design into the shop program. The method is to have interested teachers try out one or two simple approaches to design in their shops, and then report the results of these efforts to all participating teachers.

It is important to note that *any* interested industrial-arts teacher can participate. He need not have any particular skill in design. Yet, the experiment is broad enough so that teachers already using design in their shop can profit from participation.

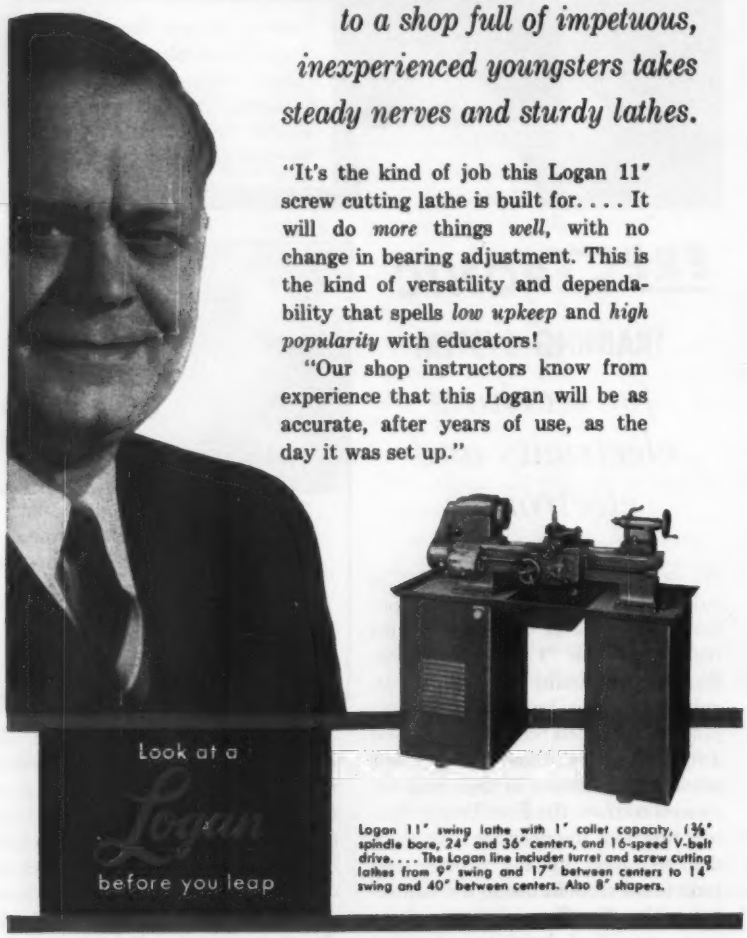
This experiment grew out of the February, 1958, SCHOOL SHOP article, "Design in Your Shop Program," by Wesley S. Sommers. In a recent sectional round table for industrial-arts teachers, Sommers invited teachers at the round-table to try out one or two of the design ideas noted in the above article. At the end of the school year summary remarks on the success, or lack of success, of their design activities, as well as any new design ideas, will be published in the "Design Newsletter" and distributed to all participating teachers. In other words, teachers will have an opportunity to learn about design through their efforts and through an exchange of design ideas and experiences.

It has been suggested that teachers throughout the country might be interested in joining this experimental program, and so with the backing of SCHOOL SHOP and Stout State College this invitation is being issued to all interested industrial-arts teachers. It costs nothing except an interest in improving project design.

Here is what you do if you want to participate. Write a note to Wesley S. Sommers, Assistant Professor, Stout State College, Menomonie, Wisconsin. Simply state that you would like to participate in the "Design in the Shop" program. You will then be sent two sets of materials: (1) an adaptation of the SCHOOL SHOP article which lists several ideas for using design in the shop—ranging from the very simple to the complicated; and (2) a form to indicate the area of design that you will try to work in.

When you return the form you will be put on the "Design Newsletter" mailing list. You will be sent the following materials: "Design and the Objectives of Industrial Arts"; "Design Procedure" (an outline); and "Definition: Design for Industrial Arts." In mid-spring you will be reminded to submit a summary—which can be very brief—of your results, reactions, and suggestions. The "newsletter" which will summarize the experiences and new suggestions will be distributed early in the summer. ★


*"This lathe is a work horse... Teaching the intricate skills of lathe metalworking to a shop full of impetuous, inexperienced youngsters takes steady nerves and sturdy lathes.*



"It's the kind of job this Logan 11" screw cutting lathe is built for.... It will do *more* things *well*, with no change in bearing adjustment. This is the kind of versatility and dependability that spells *low upkeep* and *high popularity* with educators!

"Our shop instructors know from experience that this Logan will be as accurate, after years of use, as the day it was set up."

Look at a Logan before you leap

Logan 11" swing lathe with 1" collet capacity, (⅜" spindle bore, 24" and 36" centers, and 16-speed V-belt drive.... The Logan line includes turret and screw cutting lathes from 9" swing and 17" between centers to 14" swing and 40" between centers. Also 8" shapers.

CATALOG ON REQUEST. *Phone your* LOGAN *dealer or drop a line to:*

**LOGAN ENGINEERING CO.**

DEPT. E-259, 4901 Lawrence Avenue, Chicago 30, Illinois

## SAFE!

# PERMA-GRIT*

### CUTTING WHEEL

An amazing new wheel for table or radial saws. Tungsten carbide grit permanently bonded on edge and sides replaces saw teeth. No kick-back, no-grab features provide truly safe operation. Students can saw, sand, shape, dadoe or plough without changing the blade when using this versatile accessory. Used with wood, veneers, compositions, fiber glass, plastics, it cuts *and sands* in one operation. Produces smooth finish even on thin veneers. Choose from 8" dia. with ⅝", ½" arbor hole or 10" dia. with 1", ¾", ⅝" arbor hole. Price: 8" dia.—from $9.95; 10" dia.—from $14.95.

- NO TEETH
- NO KICK-BACK
- SPEEDS LEARNING
- INCREASES WOODWORKING ABILITIES

*A Trade Mark of SKIL Corporation

Made only by SKIL Corporation, manufacturer of famous SKIL and SKILSAW products, 5033 Elston Ave., Chicago 30, Ill. In Canada: 3601 Dundas St. W., Toronto 9, Ontario

## LOOK TO KARGO by GARRETT

FOR THE FINEST QUALITY DRAWING TABLES AND SEATING DESIGNED FOR VOCATIONAL EDUCATION DEPARTMENTS!

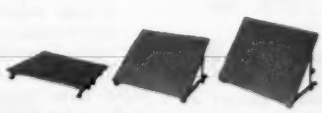
LARGE 24 x 24" ADJUSTABLE DRAWING BOARD
BUILT ON TABORET!
WELDED TUBULAR STEEL CONSTRUCTION

AC-440

OTHER MODELS AVAILABLE

OVER 25 MODELS OF CHAIRS AND STOOLS AVAILABLE EQUIPPED WITH THE EXCLUSIVE AUTOMATIC "LIFT-LOK"

Full 6" height adj.



ALL NEW E-Z PORTABLE DRAWING BOARD. COMPLETELY FOLDS AND ADJUSTS TO ANY POSITION FROM VERTICLE TO HORIZONTAL. AN ECONOMY BOARD OF HIGH QUALITY.

C-1624

WRITE FOR INFORMATION AND PRICE LIST.

**GARRETT TUBULAR PRODUCTS, INC.**
P.O. BOX 237 GARRETT, INDIANA

## LET US SEND YOU THIS NEW DELTA CATALOG

. . . It puts the world's most complete line of power tools for school shops at your finger tips—offers a single source for 53 machines, 246 models, over 1300 accessories. You can choose the right tool to teach every woodworking and metalworking operation—and students learn on the tools they'll use in industry.

*DELTA TOOLS ARE SAFE*
*DELTA TOOLS ARE PRACTICAL*
*DELTA TOOLS ARE ECONOMICAL*

**That's why: 72% of U.S. schools teaching shop teach with Delta Power Tools.**

**Send For Your FREE Catalog Today**—Complete descriptions and specifications on every Delta tool and accessory. See the complete line at your nearest Delta Dealer and ask him about Delta's unequalled teaching aids for shop instructors . . . he's listed under "TOOLS" in the Yellow Pages.

Rockwell Manufacturing Co., Delta Power Tool Division,
4128 N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS
another fine product by
**ROCKWELL**

WATCH YOUR AUTOMOTIVE STUDENTS LEARN FASTER WITH THIS

# Step-by-Step Picture Guide to Car Service and Repair

**Puts the "Meat" of 176 Official Shop Manuals Right at Your Students' Fingertips**

MOTOR'S brand-new 1959 Auto Repair Manual will make your job a lot simpler. It shows your students exactly how to locate troubles, where to start a job, what tools to use . . . how to do everything from making a simple brake adjustment to a complete overhaul.

***Most Popular Car-Repair Book in the World—Three Million Copies Sold!***

This giant book shows factory-approved procedures for repairing and servicing over 600 models—every popular make, 1952 through 1959. 1,120 giant, crystal-clear pages, 2,900 can't-go-wrong pictures, 291 quick-check charts, 23,000 essential repair specifications, 225,000 service-repair facts. Step-by-step guidance on: Engines, Automatic Transmissions, Air Suspensions, Ignitions, Fuel Pumps, Steering Gears, Brakes, Generators, Distributors, Power Brakes & Steering, etc., etc. PLUS TROUBLE-SHOOTING SECTION showing how to spot 2,300 car troubles fast! Used by U.S. Armed Forces, mechanics, schools.

***Double Offer for Teachers Only***

1. Try Manual for *full week* FREE in your own classes. If you keep it . . .
2. take the 25% special school discount off reg. price. Otherwise, return book and owe nothing. Mail certificate—without money—to: Motor Book Dept., Desk 9362, *250 W. 55th St., New York 19, N.Y.*

**Same FREE-TRIAL On These Manuals**

**Motor's Truck Repair Manual.** Details 2,860 truck models since 1952. 300,000 service, repair facts. 2,000 illus. Everything students need to make truck repair simple. Over 800 giant pages.

**Motor's Auto Engines & Electrical Systems.** Basic knowledge students need to understand modern engines: valves, pistons, bearings; fuel, cooling, elec. systems. 600 pgs., 1300 illustrations.

**25% Discount Certificate**

**MOTOR—Book Dept., Desk 9362, 250 West 55th St., N.Y. 19, N.Y.**

Send me for 7 days' FREE TRIAL:

.....copies of Motor's New 1959 Auto Repair Manual;

.....copies of Motor's New Truck Repair Manual;

.....copies of Motor's New Auto Engines.

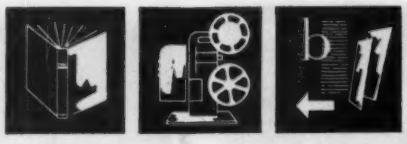
If satisfied, I will remit special 25% Discount price of only $5.96 (plus postage) for Auto Repair Manual (reg. $7.95); only $4.88 (plus postage) for Engines & Elec. Systems (reg. $6.50); only $6.75 (plus postage) for Truck Repair Manual (reg. $9.00). Otherwise I will return book(s) within 7 days and owe nothing.

Name .....

School .....

Street .....

City..... Zone..... State.....



# *instructional* Resources

## *Books:*

**Experimental Basic Electronics.** Evans and Porter. Bloomington, Ill.: McKnight & McKnight Publishing Co., 1958. Pp. 104. $3.00.

In view of the growing general interest in the use of electronic devices this book is quite timely. It contains a number of experiments, each one of which involves the application of one or more of the principles of electronics. These experiments are presented in two groups. One group covers experiments that are basic, while the second group includes others that are more advanced. This arrangement permits the teacher to assign work in accordance with each pupil's ability.

The authors have produced a text on a difficult subject, but have presented the material in a manner that makes it possible for the beginner to understand.

Rupert N. Evans and Charles B. Porter are both members of the faculty at the University of Illinois.

**Mathematics for Plumbers and Pipefitters.** D'Arcangelo, D'Arcangelo, and Guest. Albany, N.Y.: Delmar Publishers, Inc., 1958. Pp. vi+185. $2.75.

This text has been designed to fill the need for a specialized course meeting the needs of the plumbing and pipefitting trade requirements and the emphasis, therefore, has been placed on the development of usable skills in the lay out, measurements, and computations of pipe lengths.

In addition, the book also includes a review of basic mathematics fundamentals, a section devoted to sheet lead, and a section of volumes. The final section on heating provides instruction in calculating heat loss and estimating the amount of radiation and size of piping required.

The appendix to the book contains 23 tables of data required for the solution of various problems in the text.

The authors are all instructors at McKinley Vocational School, Buffalo, N.Y. Bartholomew D'Arcangelo and Benedict D'Arcangelo are both instructors in the plumbing trades. J. Russell Guest is instructor in related subjects.

**Home Air Conditioning: Installation and Repair.** Derman, Makstein, and Seaman. New York: John F. Rider Publisher, Inc., 1958. Pp. vi+152. $3.50.

This modern text is designed to provide a practical explanation of the principles of mechanical refrigeration in general and of air conditioning in particular. Starting with the basic physics of air conditioning, the book proceeds to the operation, maintenance, repair, and selection of air-conditioning units. Typical window and "package" installations are thoroughly described and illustrated as well as small commercial installations. The book contains a minimum of formulas and a maximum of step-by-step explanations. Recent and future developments in air conditioning are also covered.

**Automotive Essentials.** (Revised Edition.) Kuns. Milwaukee: Bruce Publishing Company, 1958. Pp. x+502. $6.50.

This is the sixth edition of this text and, like previous editions, it contains information needed to operate and repair automobiles and automotive equipment intelligently. It includes information on automobile air-conditioning, automatic transmissions and hydraulic drives, outboard motors, motorcycles, motor bikes, and scooters as well as automobiles.

The sixth edition includes new chapters on troubleshooting and maintenance, purchasing new and used cars, selecting the right insurance coverage, and a history of the automobile. A chapter on the new European cars also has been added.

The author, Ray F. Kuns, was a founder of Cincinnati Automotive and Aviation High Schools. He has been editing automotive books and technical magazines for 30 years.

**Properties and Uses of Ferrous and Non-Ferrous Metals.** Weiss and Leuchtman. Detroit: Royalle Publishing Co., Inc., 1958. Pp. v+66. $1.20.

This manual is designed to acquaint students and workers in the metal industry with the elementary principles involved in the fashioning of metal.

It is not intended to be a complete treatment of metallurgy, but rather is a presentation of the information that is essential to success in modern machine-shop practice. It has been used successfully by certain instructors who have the responsibility of training apprentices in the CIO apprentice program.

The manual will serve as a text and as an excellent reference for machine-shop teachers and students, as well as by craftsmen who desire to become informed concerning the technical phases of their work.

Arthur Weiss and Alex Leuchtman are engaged in the training of apprentices in Cass Apprentice School, Detroit.

## *Pamphlets:*

**Lumber Industry Facts, 1957,** is the name of the 48-page publication of the National Lumber Manufacturers Association that traces 350 years of growth and progress of the American Lumber Industry. It contains more than 10,000 facts. A limited supply of copies are available free by writing to the Association at 1319 18th St. N.W., Washington 6, D.C.

**Original Electrical Equipment for 1959 Passenger Cars** (Revised Edition) has been published by Delco-Remy Division of General Motors, Anderson, Ind. In addition,

## *For Most Effective Teaching . . .*

# McKNIGHT'S PRACTICAL SHOP BOOKS

**Feature Book for the Month**

### HANDBOOK OF DRAFTING RULES AND PRINCIPLES

#73 By Nelson

Here's a brand new handbook that proves valuable as a brief source of practical information, a standard for drafting room practice, an aid in correcting drawings, as well as useful selection of subject matter used in the instruction of drafting. Equally important is the fact that each drafting rule and principle is explained; and adjacent, detailed instructions further simplify application instructions. 151 illustrations. The 96 pages are broken down into sections on (1) Use of Drawing Tools, Lines; (2) Dimensions; (3) Lettering, Inking, Drawing; (4) Pictorial Drawing.

List price, $2.00

- Improve Student Work by Showing Them HOW
- Answer Student Questions By Telling Them WHY

### GENERAL SHOP BENCH WOODWORKING

#1 Revised 1955
By Fryklund and LaBerge

Covers the basic fundamentals of hand woodworking. Instructions on basic handtool operations. 387 "show-how" drawings and pictures illustrate information topics, give details of techniques. Valuable technical and related information. All about tools and how to use them. Types of occupations, sources of wood, processing.

CLOTH BOUND, $3.00 PAPER BOUND, $1.80

### GENERAL SHOP ELECTRICITY

#8 By Dragoo and Porter

Beginner's text in practical electricity. Includes 26 practical projects to demonstrate applications of electrical theory with explanations of how and why each works. Projects include radio construction and usable home appliances. Many illustrations.

$1.50

### METALWORK TECHNOLOGY AND PRACTICE

#31 Revised 1955
By O. A. Ludwig

An entirely new revision of the most complete general metalwork textbook ever published. Text describes tools, materials and operations common to many metalworking occupations. 662 illustrations make it interesting and useful for high school and junior high use. Huge index with over 4,000 entries, completely cross-referenced.

400 PAGES CLOTH BOUND, $4.80
#49 STUDENT STUDY GUIDE 120 pages $1.25

### GENERAL SHOP METALWORK

#30 Revised 1947 Edition
By Alva W. Dragoo

Short teaching units cover work in beginning bench metal, sheet metal, art metal, and ornamental metal. Includes designs and directions for twenty-eight projects of a practical, usable nature, which gives the student practice in the operations while he is making something of real value.

104 pages $1.40

### ADDITIONAL SHOP BOOKS

**AUTO MECHANICS**
Understanding your Car #82 ..... $1.60

**DRAFTING**
Applied Drawing and Design #43 ..... est. $4.00
Blueprint Reading, Checking and Testing #17 Part I, $1.20; Part II, $1.20
Blueprint Reading and Sketching #14 ..... $1.00
General Drafting #15 ..... $1.50
Graphic Architectural Drafting #80 ..... $4.80
A Handbook of Drafting Rules and Principles #73 ..... $2.00
Introduction to Applied Drawing #28 ..... $1.00

**ELECTRICITY**
General Electricity #13 ..... $1.50
Principles of Electricity #9 ..... $4.00
Projects in Electricity #12 ..... $1.25

**ELECTRONICS**
Experimental Basic Electronics #84 ..... est. $3.00

**FORGING—WELDING**
Gas and A.C. Arc Welding and Cutting #36 ..... $1.50
Forging and Welding #37 ..... $3.60

**LEATHERCRAFT**
General Leathercraft #75 ..... $1.50

**METALWORKING**
Machining of Metal #32 ..... $3.60
Sheet Metalwork #39 ..... $1.25
Etching, Spinning, Raising and Tooling Metal #41 ..... $1.50

**METALWORK DESIGN**
Contemporary Metal Home Furnishings #69 ..... $2.50

**METALWORK PROJECTS**
Practical Metal Projects #88 ..... $2.50
Projects in Sheet Metalwork #94 ..... in works
Contemporary Metal Home Furnishings #69 ..... $2.50

**PRINTING**
General Printing #7 ..... $3.00

**PLASTICS**
General Plastics #70 ..... $1.80

**TEACHING**
Teaching successfully the Industrial Arts & Vocational Subjects #58 ..... $4.50
Teaching Multiple Activities in Industrial Education #96 ..... $5.00

**WOODWORKING**
Machine Woodworking #2 ..... $3.60
Finishing Materials & Methods #26 ..... $4.00

McKNIGHT & McKNIGHT
PUBLISHING COMPANY • BLOOMINGTON, ILL.

### *FREE 30-DAY APPROVAL*

**McKNIGHT & McKNIGHT,**
**Dept. 636, Bloomington, Illinois**

**Send me your NEW FREE CATALOG and the books circled for 30-day approval.**

1 2 7 8 9 12 13 14 15 17 26 28 30 31 33 36
37 39 41 43 49 55 56 60 66 69 73 75 79 82 84 94

Name_____
School_____
Address_____
City_____ Zone____ State_____

*school shop case history:*

**ONE TORIT CYCLONE DUST COLLECTOR CLEANS 3 WOODWORKING MACHINES**

*Fred A. Koertge, Industrial Arts Instructor, Refugio High School, Refugio, Texas, says: "The Torit Dust Collector is very efficient, not noisy, and is very clean. The three machines serviced are a 20" planer, 20" band saw, and 10" jointer. There are gates in the pipeline at each machine and they can be opened or closed separately."*

Check other school shop instructors—check health officials and maintenance experts: they'll all tell you that dust and air-borne debris are a very real menace. The answer is low cost, high efficiency Torit Dust Collectors, in either cyclone or cabinet models. They install *anywhere*—and they belong *everywhere* dust is a problem.

*Write:* Educational Department

**TORIT**

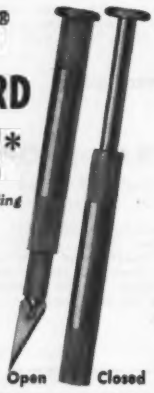
**MANUFACTURING COMPANY**
Walnut & Exchange Streets,
St. Paul 2, Minn., DPT. 1416

*A new craft tool!*

**x-acto®**
**SAFETY-GUARD KNIFE***

**Pat. Pending*

Sliding metal guard for absolute safety in carrying, handling and storage. Accommodates the regular surgically-sharp, instantly interchangeable X-acto blades. Won't roll off inclined surface.



**Guard Adjusts to any Position**

Open Closed

Chuck principle — ½ turn and guard moves freely outside of knife.

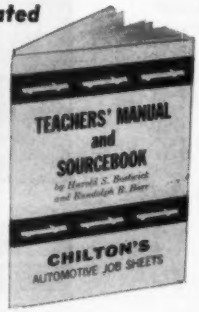
Pull until blade is covered (or any in-between position); ½ turn locks guard.

*No. 1G (Illustrated) $1.20*
*No. 2G (Not Shown) $1.50*
(Heavy Duty Model)
*Send For New Catalog*

**X-ACTO, INC.**
48-93 Van Dam Street
Long Island City 1, N. Y.

***Complete Illustrated Step-by-step procedure***

**CHILTON'S AUTOMOTIVE JOB SHEETS for**




**Vocational, Technical, High Schools**

Following standards recommended by the IA-VE Conference, these brand new teachers' aids were created for use in the school shop. Never before available. They conserve teaching time by reducing the need for lecture-type instruction. Separating the "how to" from the "why," these flexible job sheets can be used on live cars or instructional units and varied according to the equipment used.

**Write in for copies on 30-day approval:**

**I. THE ENGINE WITH SUPPLEMENT ON THE FUEL SYSTEM, $3.80**
**II. The CHASSIS, $2.45**
**III. THE AUTOMOTIVE ELECTRICAL SYSTEM, $2.45**

**TEACHERS' MANUAL AND SOURCEBOOK, $1.35**

***25% educational discount***

**CHILTON COMPANY** A CHILTON BOOK **BOOK DIV.**
**56th and Chestnut Sts.**
**Phila. 39, Pa.**


a related training-chart set that includes enlarged pictures of many of the illustrations and diagrams found in the booklet is available. The booklet contains 20 pages, has 33 illustrations, and is free. The training-chart set costs $5.00. Both available from the firm at Anderson, Ind.

**Drawing for Good Reproduction** is a 32-page, multicolored booklet written by Arthur H. Rau and published by the National Association of Blueprint and Diazotype Coaters. It was prepared and published in the interest of creating an awareness of the importance of good drawing to good reproduction. Single copies cost a dollar and are available from the Association at 1757 K St., N.W., Washington 6, D.C. Quantity rates are available.

**The Scientific Instrument Industry, The Fine and Applied Arts, and The Aircraft Industry** are three new booklets in the Vocational and Professional Monographs series published by Bellman Publishing Company. Written by James R. Irving, Royal B. Farnum, and Henry T. Simmons, respectively, the pamphlets are available for $1 each from the publisher, Cambridge 38, Mass.

**1958 Handbook on Women Workers,** Bulletin No. 266, Women's Bureau, U. S. Department of Labor, is the biennial report on women's employment and occupations, including women's educational status and women's earnings and income. This 153-page booklet is available for 45¢ from the U. S. Government Printing Office, Washington 25, D. C.

**Photography in Your Future** is the name of a pamphlet written by A. L. TerLouw, educational consultant for Eastman Kodak Company. The pamphlet is designed to be of help to those counselors who might be asked to give advice regarding photography as a career. It is available free by writing to the firm at Rochester 4, New York.

### *Audio-Visuals:*

**Magnetic Sound Recording for 16mm Motion Pictures** is a 64-page, illustrated booklet published by the Eastman Kodak Company. It tells how to prepare a script, how to shoot for sound, what the basic recording techniques are, etc. For a copy, send 50¢ to the firm and request Kodak Publication No. P-26. The address is Rochester 4, New York.

**16mm Films for Labor** is a 71-page booklet listing films available from the American Federation of Labor and Congress of Industrial Organizations. The booklet, priced at 25¢ with discounts in quantity, is available from the AFL-CIO Department of Education, 815 Sixteenth St., N.W., Washington 6, D. C.

**Farm Machines for a Land of Plenty** is a 36-frame black and white filmstrip describing the development of power machinery that revolutionized American farm methods. The film strip with Supplementary Teaching Guide is available for $3.50 from Visual Education Consultants, Inc., 2066 Helena St., Madison 4, Wis.

**It's in the Cards, It Didn't Have to Happen,** and **Punch Press Guarding** are three black and white safety films available from International Film Bureau, Inc. Information on sale and rental prices available from the company, 57 E. Jackson Blvd., Chicago 4, Ill.

*Write your own specifications!*

**COLUMBIAN**

**Woodworkers' Vises meet every need!**

**Columbian No. 7CDW**

You have your choice of 2 sizes and 2 types of continuous screw mechanisms... Rapid Acting... or Solid Nut.

You may select Plain or Dog Type front jaws. You may specify Hardwood, Tubular Steel or Adjustable Steel Handles. Write for Bulletin LL-3184.

**COLUMBIAN Vises** The Columbian Vise & Mfg. Co.
CLEVELAND 4, OHIO
*Sold by leading distributors*

**IMPORTANT MESSAGE TO PLASTIC CRAFT TEACHERS!**

COPE PLASTICS (formerly D. W. Cope Plastics) is proud to announce that we are now operating from our brand new warehouse and plastics fabricating plant. Increased floor space, a greatly expanded inventory, an improved method of handling orders enable us to offer you IMMEDIATE SHIPMENT of PLASTICS FOR EVERY CLASSROOM NEED!

If you want to SAVE TIME, SAVE BOTHER, to enjoy the benefits of obtaining the plastic needs of your students from ONE DEPENDABLE SOURCE—check off your requirements on the following list then write for COPE'S 1959 PLASTICS CATALOG and buying guide, and schedule of school discounts.

- ☐ Plexiglas, clear & colored
- ☐ Lucite Tubing & Rods
- ☐ Cellulose Acetate
- ☐ Styrofoam
- ☐ Adhesives, Buffing Wheels & Compounds
- ☐ Dyes, Blending Granules, Filling Plaster for Internal Carving
- ☐ Jewelry Findings
- ☐ Fiberglas-Polyester Resins
- ☐ Carving Tools, Drills
- ☐ Tenite II Screw Driver Handle Stock
- ☐ Castolite Liquid Casting Plastic
- ☐ Electric Ovens
- ☐ Salvage Material
- ☐ Plastic Lacing, Cord, Ribbon & Belting

**FREE!** Instruction sheets for making Decorative Fiberglas Bowls and Internal Carvings for distribution to students. Write on School letterhead stating quantity of each you need.

**COPE PLASTICS** Dept. G

**Highway 100** **Godfrey, Illinois**

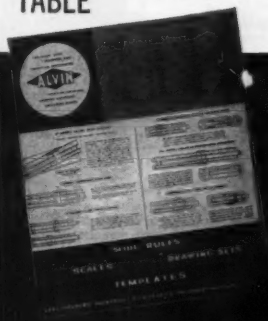
*"Just Across the Mississippi from St. Louis"*

**A MUST FOR EVERY TEACHER**

**Now Available!**

**FREE!**

NEW ALVIN **READY REFERENCE CHART** With DECIMAL TABLE



**ALVIN**

America's Most Complete Line Of

- DRAWING SETS
- DRAFTING INSTRUMENTS
- DESIGNING AIDS
- DRAFTING MATERIALS
- DRAWING EQUIPMENT
- MEASURING DEVICES

If you buy or specify drafting materials and drawing instruments, write for this handy Ready Reference Chart with convenient decimal table. Here's a fully illustrated Reference Chart showing the complete Alvin line. Makes a handy buying reference for mechanical and architectural drawing teachers. Can be tacked on a wall for students' reference. For your free copy write to Alvin . . . Today!

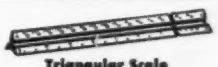
**HERE'S A FEW OF OUR STUDENT SPECIALS**



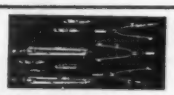
**Star Drawing Pencils**
No. 5054 Retail $.90 doz.

**"T" Square**
No. C-18 — Retail $2.75

**Basswood Drawing Board**
No. DB111-Retail $1.90



**Triangular Scale**
No. 210-Retail $.90



**Scholastic Drawing Set**
No. 912 Retail $8.00

**Special Educational Discounts To All Schools And Industrial Arts Instructors**
**FREE ACHIEVEMENT AWARDS On Orders Exceeding $75.00**

*"QUALITY AT THE RIGHT PRICE"*

**ALVIN & CO., INC.** Windsor, Connecticut

MAIL THIS COUPON TODAY!

Alvin & Co., Inc.
Windsor, Connecticut

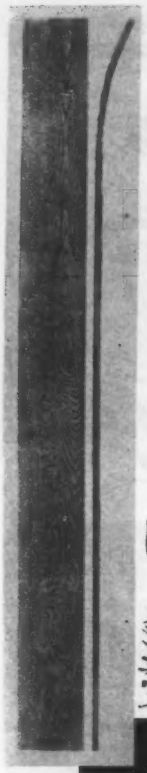
Please send me the FREE 1958 Alvin Ready Reference Chart.

Name_____ Position_____

School_____

Address_____

City_____ Zone_____ State_____



NEW LEARNING UNIT

STUDENTS BUILD

WATER SKIS

*from quality S-4-S (bent only) stock— finest grade fittings supplied*

*Students start with rough pre-bent blanks shown here*

Now any student can own the finest water skis it is possible to build and, at the same time, increase his woodworking skills. The ski blanks and fittings are supplied by one of the world's largest producers of quality water skis. Scale drawings and instruction sheet included.

SPECIFICATIONS:

Stock 5/8" thick x 7" wide x 6' long. Permanently bent at one end with hardwood spline reinforcing toe of ski. Choice of Marine Plywood with Crezon surface, Sitka Spruce, Philippine Mahogany, Solid White Ash. BINDINGS: White Neoprene rubber. Aluminum parts, single adjustment, self-locking heel plate.

*Ask one of these distributors for full details and prices.*

Brodhead-Garrett Company, Cleveland, Ohio
General Hardwood Company, Tacoma, Washington
J. E. Higgins Lumber Company, San Francisco, Calif.
Omaha Hardwood Lumber Co., Omaha, Nebraska
Frank Paxton Lumber Company, Kansas City, Missouri; Chicago, Illinois; Milwaukee, Wisconsin; Denver, Colorado; Des Moines, Iowa; Fort Worth, Texas; Midland, Texas.
Lumber Products, Portland, Oregon
Southwest Supply Co., Inc., Glendale, California
Streble Lumber Company, Oakland, California
Strevell-Paterson Hardware Co., Salt Lake City, Utah
L. E. Vinson & Company, Tucson, Arizona
Winde-McCormick Lumber Co., Charlestown, Massachusetts; Providence, Rhode Island
Youngblood Lumber Company, Minneapolis, Minn.

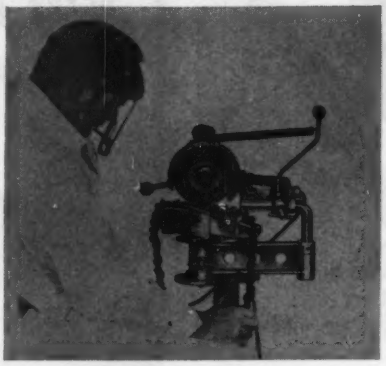
*Manufactured by*

**WESTERN WOOD MFG. CO.** • Portland, Oregon

# *news from Industry*

**(Circle the numbers on the card in this issue to secure the items listed.)**

## Semiautomatic Grinder Remachines Saw Chains



A saw-chain grinder that sharpens chain-saw cutters with exact uniformity has been recently announced by the Fate-Root-Heath Company.

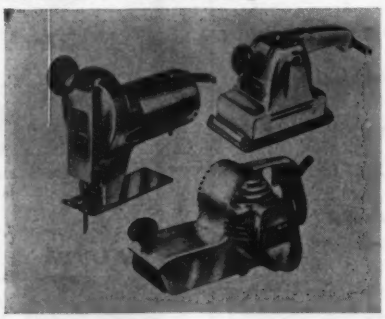
The company claims that its Model 30 Peerless, the new grinder, is compact, accurate, and easy to operate. The firm says it can be used on either its own pedestal or on a bench.

The specifications show that a high-speed reversible motor provides just the right amount of power and that it grinds both left-hand and right-hand cutters in the proper direction to reduce heat and wire edges.

The company says the grinder is engineered for precision remachining of chipper, chisel, and cross-cut saw chains.

For more information write to the firm at Plymouth, Ohio, mentioning SCHOOL SHOP; or *circle no. F-1 on the business-reply card.*

## Peninsula Tool Offers Its Line for School Shops



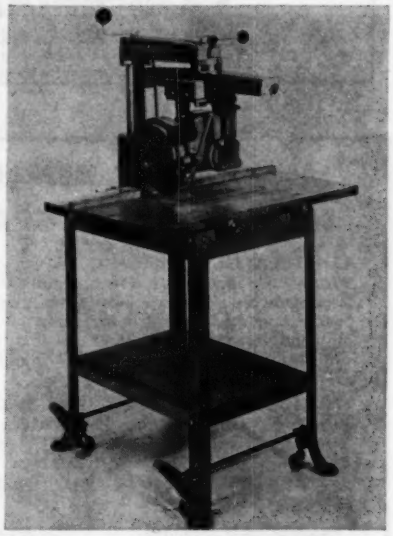
Hi-Lo power tools, manufactured by the Peninsula Tool Company, have mechanical features that add to their ruggedness and power and make them particularly worthwhile to anyone interested in economy, the company states.

The tools, an oscillating sander, a sabre saw, and a belt sander, all come equipped with GE motors. The oscillating sander is direct drive, operating at 8500 rpm, and the sabre saw operates at 4000 strokes per minute, the firm states.

For more information write to the company at Menominee, Mich., mentioning SCHOOL SHOP; or *circle no. F-2 on the business-reply card.*

## Delta Introduces New 9" Radial Saw

A new 9" radial saw called the "Super 900" has been introduced by Delta for general woodworking purposes. Improvements, according to the company, include a more powerful motor and up-front controls for adjusting the table fence. The more powerful 1-hp motor which actually develops up to 2 hp under load, according to the company, enables the saw to cut straighter, faster, and smoother which makes it safer because greater power greatly reduces possibilities of bucking, stalling, or kick-back during heavy cuts.



The new saw has a cross-cut capacity of 15" and will rip to the center of a 48" panel. Maximum depth of cut is 2½" and dado capacity is 13/16" wide with a 6" dado. The motor has an overload reset button, lubricated-for-life bearings, and 115/230 voltage with speed of 3450 rpm on 60-cycle current.

For further information write Delta Power Tool Division, Rockwell Mfg. Co., 493 N. Lexington Ave., Pittsburgh 8, Pa., mentioning SCHOOL SHOP; or *circle no. F-3 on the business-reply card.*

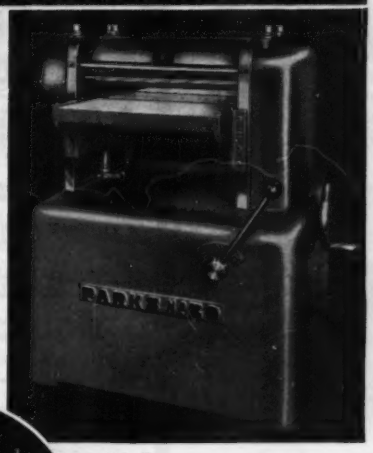
## Sams Buys Control of Bobbs-Merrill

The Howard W. Sams & Co., technical publishers of Indianapolis, Ind., has recently purchased controlling interest of The Bobbs-Merrill Company, 120-year-old publishing firm of the same city.

According to Howard W. Sams, Bobbs-

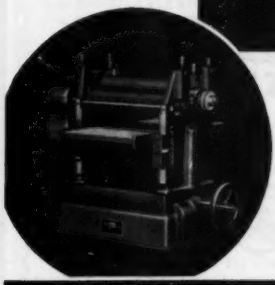
## PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

. . . the experience of working on the same type of high-speed planers they will eventually use in their trade.



### 20" THICKNESS PLANER

PARKS NO 20—A modernly designed, precision-built, high speed production surfacer that planes lumber up to 20" wide and 6" thick. Available with knife-grinder at additional cost.



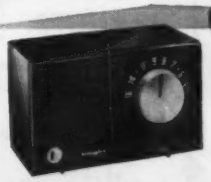
### 12" THICKNESS PLANER

PARKS NO. 95 — A compact, sturdy thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive literature on both machines illustrated as well as on PARKS wood- and metal-cutting Band Saws, Radial Saws, Planer-Jointer Combination Machines.

**The PARKS WOODWORKING MACHINE COMPANY**
Manufacturers of Quality Woodworking Machines Since 1887
DEPT 22, 1546 KNOWLTON STREET, CINCINNATI 23, OHIO

## Best for Training in Electronics

**knight-kits**
an ALLIED RADIO product



**"Ranger" AC-DC Radio Kit**
Popular 5-tube superhet radio project. Thousands used in shop training. Teaches radio construction. Complete with cabinet.
**83Y736.** Only.....**$16.95**

**12-in-One Electronic Lab Kit**
Widely used by schools for instruction in electronics. Performs 12 separate experiments with only a simple wiring change required for each project (components, once mounted, need not be disassembled). Projects are: receiver, amplifier, "broadcaster", code oscillator, flasher, timer, transmitter, electronic relays, etc. With all parts, including relay, photocell, microphone. Shpg. wt., 3½ lbs.
**83Y272.** Only.....**$14.95**

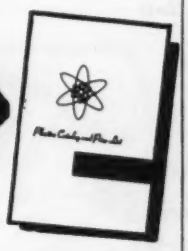
**"Space-Spanner" Receiver Kit**
Exciting school project; tunes world-wide short wave as well as broadcast. Packed with interesting features.
**83Y259.** Only.....**$18.95**

**FREE** ALLIED'S 452-PAGE **1959 CATALOG**
Offers everything in electronics for the school: Knight-Kits for training; sound and recording equipment; lab instruments, tools, books, electronic parts. Write for FREE copy today.

See our catalog for many other fine Knight-Kits

**ALLIED RADIO**
100 N. Western Ave., Dept. 9-89
Chicago 80, Ill.

## FREE!
TO INDUSTRIAL ARTS INSTRUCTORS



### Plastics Catalog and Price List

Write today for your new 1957-1958 copy of this up-to-the-minute Plastics Catalog. You will find us your best market for every kind of plastic material, accessories, findings, cements, books, tools, etc. Special school discount. Your free manual will be sent you by return mail.

**HOUSE OF PLASTICS**
8648 Linwood
Detroit 6, Mich.

## BILLINGS
*Since 1869*
*Tools and Forgings of Quality*

**WRENCHES**
**SHOP TOOLS**
FREE BOOKLET GLADLY SENT

THE BILLINGS & SPENCER CO.
HARTFORD, CONNECTICUT

## PEXTO CRIMPER and BEADER

This dual-use machine performs both operations at one time . . . or either one alone . . . with easy interchanging of rolls. It's a profitable installation for any shop. New PEXTO catalog gives all details. Write for your copy.

Complete line of machines and tools for sheet metal fabrication.

THE PEXTO STOW & WILCOX COMPANY, SINCE 1885, SOUTHINGTON, CONNECTICUT, U.S.A.

## To Restore Original Finish—
or
## To Use on an Unpainted Surface—

If furniture, etc. has been badly marred, or it is to be refinished, Campbell's Pigmented Wiping and Uniforming Stains will be most useful.

Made of light, fast pigments that do not raise the grain, Non-bleeding! Finish is semi-opaque. These stains can be brushed, sprayed or dipped. In Oak, Walnut, Mahogany, Blonde, Platinum, Driftwood, Maple, French Provincial and Cherry.

This is another "You-can-count-on-Campbell's" item of Stains, Varnishes, Lacquers, Enamels and other finishing supplies for school shops. Your ONE source for ALL your needs. *Send for Catalog No. 119-SS2.* (Sent to schools and shop instructors only)

**The M. L. CAMPBELL CO.**
2909 Chrysler Road • Kansas City, Kansas • Phone FI 2-0705

Students learn Best... with Highest Quality Soldering Tools

... by American Beauty

No. 3120-SC
3/16" TIP
30
WATTS

No. 3125
1/4" TIP
60
WATTS

No. 3138
3/8" TIP
100
WATTS

Shown above are some of the irons students of today will use on the jobs of tomorrow

It's smart to teach your students to use the same highest quality soldering irons that industry has used since 1894. American Beauty has the right model, with the correct tip size and proper watt input, to do any soldering job quickly, properly and efficiently. Teach your students with the best soldering irons made.

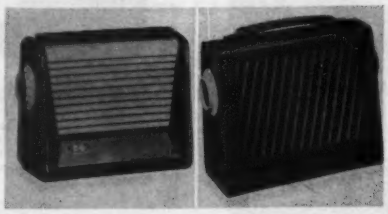
Write for 20-page illustrated catalog containing full information on our complete line of electric soldering irons—including their use and care.

AMERICAN ELECTRICAL HEATER CO.
DETROIT 2, MICHIGAN


Merrill will retain its present identity and will continue with its educational, legal, and trade-book departments. The Bobbs-Merrill Company has introduced some of the most famous literary names of this country. Among them are Ring Lardner, Bruce Barton, Mary Roberts Rinehart, John Erskine, Irvin S. Cobb, and Henry Steele Commager.

Howard W. Sams becomes new chairman of the board.

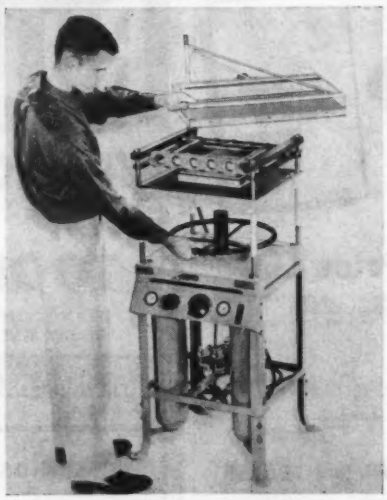
### Heath Develops New Transistor Portable Radio Kit



Radio students will be interested in the new XR-1P and XR-1L six-transistor portable radio kits. The first has a molded plastic case while the latter has a leather case with carrying strap. Use of a large 4" x 6" PM speaker and roomy chassis makes construction easier, states the company. Transformers are prealigned and set has built-in rod-type antenna. Standard "D" flashlight cells give between 500 and 1000 hours of playing time.

For further information write the Heath Co., Benton Harbor, Mich., mentioning SCHOOL SHOP; or *circle no. F-4 on the business-reply card.*

### Plastic Press Has Built-In Heating Unit



A radiant heater panel with pivot mounting has been added to the Model 18 Di-Acro Plastic Press to facilitate forming thermoplastic sheet materials, according to the manufacturer, O'Neil-Irwin Manufacturing Company.

This addition will be standard equipment on all Model 18's, the company says. It has a maximum heat temperature of 660° F., which is sufficient to provide a short heat cycle on all thermoplastic sheets.

The firm adds that experience at several teacher-training institutions and school systems where the press is in use has indicated that sheet forming with the unit has improved when a heat source has been added to the


CMC QUALITY CRAFTMETAL

enhances students' chances of outstanding achievement!

ETCHING
STIPPLING
HAMMERING

NEWS FLASH!
COLORAMIC ALUMACRAFTING IS HERE!
Now, you can offer your students aluminum circles in five gorgeous colors.
Send for FREE literature today!

Students' metalcraft projects get the benefit of the best materials obtainable when you supply your classes with our Super-Brite MIRROR-Finish Aluminum and other specially-prepared craft metals. Available in circles (flat or preformed), in rectangles (flat or preformed), in bracelet blanks and other shapes... for etching, hammering, stippling and other treatments... in making trays, coasters, bracelets, medallions, pendants, plaques and many other beautiful and useful items... *Craft Metals Corporation craft metals are tops!*

SAFE-T-ETCH
NON-ACID ETCHING AGENT
a boon to the craft instructor

Safe-T-Etch, our new non-acid etching compound, is growing rapidly in popularity—especially in group work—because it does away with the old hazards and objectionable features of etching with acid. Students are extremely enthusiastic with this safer ...faster...easier way of etching aluminum.

MAIL COUPON TODAY FOR
FREE BOOKLET
AND METAL PRICE LIST

CRAFT METALS CORPORATION
(Formerly Metal Goods Corporation)

CRAFT METALS CORPORATION
1610 Hampton Avenue F
St. Louis 10, Mo.
(Please print or type)

Name_____
Address_____
City_____ Zone____ State____
School_____

# SAMS BOOKS

***...have the classroom in mind***

**MOST WIDELY USED PUBLICATIONS FOR EFFECTIVE INSTRUCTION IN:**

- ▲ *Television*
- ▲ *Radio*
- ▲ *Electronics*
- ▲ *Electricity*

***Ideal for your classroom***

- LEARNING ELECTRICITY FUNDAMENTALS.....EFC-1
- BASIC ELECTRICITY MANUAL.....ED-12
- BASIC RADIO MANUAL.....ED-1
- BASIC TELEVISION MANUAL.....ED-21
- PHOTOFACT TELEVISION COURSE.....TV-1
- COLOR TV TRAINING MANUAL.....TVC-1
- RADIO RECEIVER SERVICING.....RS-1
- TV SERVICING GUIDE.....SGS-1
- KNOW YOUR OSCILLOSCOPE.....KOS-1
- 101 WAYS TO USE YOUR SIGNAL GENERATOR..TEM-1
- HANDBOOK OF ELECTRONIC CIRCUITS.....HEC-1

Student Notebook Sheets—RADIO.....VLV-1
Student Notebook Sheets—TELEVISION..VLV-2

**FREE TO INSTRUCTORS**

Send coupon at right for Free INSTRUCTOR'S PACKET ED-8 containing Wall-sized Block Diagrams of TV and Radio, latest Test Equipment Data, Planning Information, descriptions of new Radio and TV Student Notebook Sheets, and Free Book List.

**ORDER TODAY!** 30-DAY APPROVAL ON ALL SAMS PUBLICATIONS

**HOWARD W. SAMS & CO., INC.**
2215 E. 46TH STREET • INDIANAPOLIS 5, INDIANA

Send me the following books (with 30-day return privilege):

| | | |
|---|---|---|
| ☐ EFC-1....$5.95 | ☐ TV-1.....$3.00 | ☐ TEM-1....$2.00 |
| ☐ ED-12.... 5.00 | ☐ TVC-1.... 6.95 | ☐ KOS-1.... 2.00 |
| ☐ ED-1..... 5.00 | ☐ RS-1..... 2.50 | ☐ HEC-1.... 1.00 |
| ☐ ED-21.... 5.00 | ☐ SGS-1.... 2.00 | ☐ VLV-1..... .25 |
| | | ☐ VLV-2.... .35 |

☐ Free Instructor's Packet ED-8.

$_____ enclosed. ☐ Bill as instructed

Name_____

Position_____ Subject-Field_____

School_____

Address_____

City_____ Zone____ State_____

**SIMPLIFIES INTERIOR WOOD FINISHING**

Use Deft, alone, from raw wood to bar top finish. Do not thin.

1. Sandpaper to smooth base.
2. Apply Deft with full brush or roller. Brush marks will not show.
3. Deft dries in 30 minutes. May be re-coated in 2 hours or less.
4. For a satin-smooth deft finish fine-sand first coat lightly.
5. Final coat may be steel wooled to a hand-rubbed effect finish.

*Trouble-free* . . . any "skips" may be spotted in and steel wooled to match perfectly.

Used by Industrial Arts Classes from coast to coast.

***Wherever paints are sold, or write:*** **SS-59**

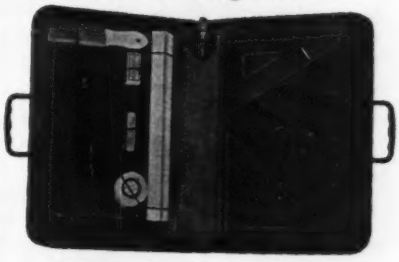
**DESMOND BROS., 1826 W. 54th St., Los Angeles 62, Calif.**

Factories: Alliance, Ohio; Los Angeles, California

***Used and praised in hundreds of schools!***

**BERGER "all-in-one" Drafting Kits**

All needed drafting tools combined in this one easy-to-carry case! Students come to class fully equipped, don't have to beg the loan of a protractor, a triangle or scale. Sessions get under way promptly! Instructors in hundreds of schools say it's today's indispensable teaching aid. Tell your students about it.



Berger Drawing Set #510 plus complete kit: $10.50

Prices quoted are for 6 or more kits. Instructors may buy sample kit at same low price.

**YOUR CHOICE OF 8 DIFFERENT DRAWING SETS—PLUS**

| | |
|---|---|
| Protractor | French Curve |
| Engineer's Scale | Draftsman's Tape |
| Architect's Scale | Pencil Pointer |
| 8" Triangle (45°-90°) | 2 Drawing Pencils |
| 10" Triangle (30°-60°) | 2 Erasers |

All in attractive, durable, 12" x 16" 3-way zipper carrying case of scuffproof, waterproof Texon with slide-in handles. Inner compartments for papers. Opens to 16" x 24".

**Prices for Complete Kits: $7.86 to $18.90**

**NEW ECONOMY SIZE PORTA-DRAFT KITS FROM $5.58**

**Choice of drawing sets . . . *plus***

| | |
|---|---|
| Protractor | French Curve |
| 12" Triangular Scale | Pencil Pointer |
| 6" Triangle (45°-90°) | Drawing Pencil |
| 8" Triangle (30°-60°) | 2 Erasers |

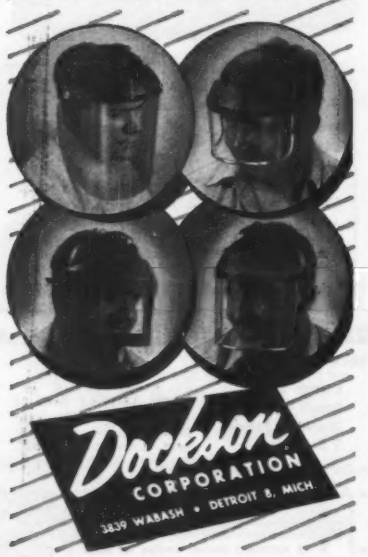
In handy 10" x 14" zipper carrying case of Texon. Two inner compartments for note papers. Opens to 14" x 20".

*Write for literature and complete prices.*

**BERGER** SCIENTIFIC SUPPLIES, INC.
41 Williams Street, Boston 19, Mass.
MATERIALS AND EQUIPMENT FOR ENGINEERS, ARCHITECTS, SURVEYORS AND DRAFTSMEN

**Famous for comfort, maximum protection and long service life. Featherweight but sturdy construction to suit your specific job requirements. Ample ventilation. Adjustable molded fibre headgear. Replaceable sweat pads. A style for every job.**

Write for complete Head & Eye Protection catalog and name of your nearest Dockson Dealer.

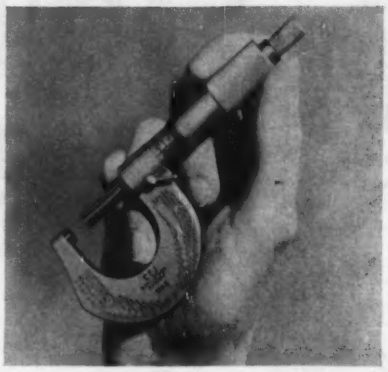




machine rather than using an external heat source such as an oven.

For additional information write to the company at 611 Eighth Ave., Lake City, Minn., mentioning SCHOOL SHOP; or *circle no. F-5 on the business-reply card.*

### Swedish Micrometers Sold by MG Tool Co. in U.S.



The line of precision micrometers made by the C. E. Johansson Gage Co., a Swedish firm and originators and manufacturers of Johansson gage blocks, is now being marketed exclusively in the U.S. by the MG Tool Company.

Compact and light in weight, according to the new distributor, the micrometers are available in .001" and .0001" graduations and each can be had with either a carbide-tipped spindle and anvil, or one of high-carbon steel. A distinguishing feature, too, is a solid bronze inner sleeve which eliminates friction between the spindle and sleeve, thus resulting in smoother operation and longer life, the firm says.

For more information write to the new distributor at 80 White St., New York 13, N.Y., mentioning SCHOOL SHOP; or *circle no. F-6 on the business-reply card.*

### Holding Device Clamps Two or More Materials

A spring clamp for holding edges of two or more thicknesses of wood, metal, plastic, fiberglass, and other workable materials has been recently introduced by the Wedgelock Corporation.

Known as "Edgelock," the clamp has a grip capacity of 65 lbs., the company claims. The specifications show that it has 1" jaw openings, weighs approximately 1 oz., has an overall length of 2¼", and the spring is completely enclosed for protection to the operator as well as the clamp itself. The Edgelock is set and released with clamp-setting steel pliers.

For additional information write to the firm at 5446 Satsuma St., North Hollywood, Calif., mentioning SCHOOL SHOP; or *circle no. F-7 on the business-reply card.*

### King Announces Merger Plus Two New Saws

The King Machine and Manufacturing Company has recently acquired the complete line of Berkroy sheet-metal working equipment and Berkroy rubber-stamp presses.

The Berkroy Company will become a division of the King Machine and Manufacturing


PACO

*electronic instrument kits*

**BASIC IN THE ELECTRONIC SHOP and as STUDENT TERM PROJECTS**

- **PACO KITS** are engineered and produced under the auspices of a leading electronic test equipment manufacturer.
- **PACO KITS** are conveniently available from regular local distributors—no need to write for them and wait.
- **PACO KITS** are free from all hidden charges over and above the factory advertised price—no extra freight costs, insurance, etc.
- **PACO KITS** are equipped with step-by-step instructions and giant-size wiring diagrams so complete, detailed and simple, that the difference between the expert and novice builder disappears.

PACO

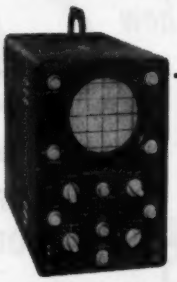
A Division of *PRECISION* Apparatus Co., Inc.

*offers*

**A COMPLETE LINE OF TEST INSTRUMENT KITS**

*for:*

- **Radio and TV Service**
- **Hi-Fi custom-building and service**
- **Hobbyists and Amateur Radio**
- **Science Education and Technical Schools**



**MODEL S-55**

5-Inch WIDE-BAND OSCILLOSCOPE

*Response DC to 5 Megacycles*

**VERTICAL CHANNEL**—3 stage push-pull.
**Sensitivity:** DC 70 mv/in; AC 25 mv RMS/in.
**Response:** within 3 db to 4.5 Mc and 5 db at 5 Mc.
**Rise time:** Better than .08 microseconds.

**HORIZONTAL CHANNEL**—push-pull output.
**Sensitivity:** 0.6 V. RMS/in.
**Response:** within 3 db from 1 cycle to 400 Kc.

**LINEAR TIME BASE**—10 cps to 100 Kc continuous, plus TV-V and TV-H frequencies.

**Model S-55.....Kit Net Price: $87.50**
*Also available factory-wired as*
**Model S-55W.....Net Price: $139.50**

**FREE:** An informative, illustrated brochure, entitled, ***Shop Facilities For Teaching Radio-Electronics-Television*** *especially written for electronics instructors, supervisors and administrators by P. B. Zbar, Electronics Dept., New York Trade School. MUST be requested on school letterhead.*

PACO ELECTRONICS CO., INC
70-31 84th Street, Glendale 27, L. I., N. Y.
Export: Morhan Exporting Corp., 458 Broadway, New York 13, N.Y.
Canada: Atlas Radio Corp. Ltd., 50 Wingold Ave., Toronto 19

# ARMSTRONG

**Teach with the tools actually used in industry**

with ARMSTRONG TOOL HOLDERS—used in over 96% of the Machine Shops and Tool Rooms. A complete system of Tool Holders comprising over 250 sizes and shapes. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES—Hi-Ten and Armaloy Steel Open End Wrenches; Box Socket and Detachable Socket Wrenches with improved designs, better balance, finer machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forged Lathe Dogs that are standard everywhere.

*Write for Catalog and Cutter Grinding Charts, sent upon request to instructors.*

**ARMSTRONG BROS. TOOL CO.**
*"The Tool Holder People"*
**5252 W. ARMSTRONG AVE., CHICAGO 46, U.S.A.**

## Your Headquarters for Wood and Metal Shop Supplies

The oldest...and most reliable . . . firm in the School Shop Supply Field.

**PATTERSON BROTHERS**
15 PARK ROW NEW YORK 38, N.Y.
YOUR MOST DEPENDABLE SOURCE SINCE 1848

This NEW Improved 801 SCHERR MICROMETER

has the Best BALANCED DROP-FORGED FRAME resulting in more accurate measurements in the hands of skilled and unskilled workers alike.

The Micrometer head is *"Lustro-Chrome"* furnished at NO EXTRA COST.

The Easy-to-Read 1/10,000" Vernier is furnished at NO EXTRA CHARGE.

TODAY'S best buy in Precision Micrometers suitable and affordable for Schools, School-Shops, Students, Fine Mechanic's Inspectors, etc.

It will pay to investigate SCHERR Micrometers before investing Tool-Dollars.

Special arrangements for Group-Purchasers, Educational Institutions and Schools.

A FULLY MODERN MICROMETER AT THE OLD REASONABLE PRICE

0-1" Size with LOCKNUT and RATCHET and 10th Vernier (as shown) **$14.00**

0-1" Size - Flats - 10th Vernier **$11.75**

Tungsten Carbide Tipped Anvils $2.50 extra

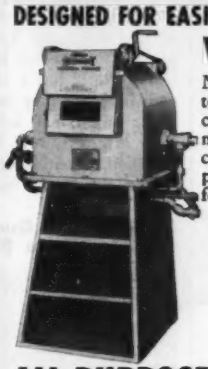
Other Sizes and Models Available

*Ask for Micrometer Catalog—Code G10DI*

**GEORGE SCHERR CO., Inc.** COMPLETE LINE OF PRECISION INSTRUMENTS
200-55 LAFAYETTE STREET • NEW YORK 12, N. Y.
West Coast Branch—Scherr Tumico Co., 3337 W. Olympic Blvd., Los Angeles 19, Cal.

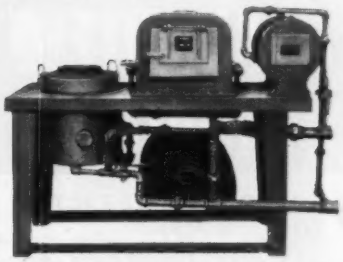
## Sunbeam SCHOOL SHOP FURNACES

**DESIGNED FOR EASIER INSTRUCTION—LONGER SERVICE!**



### WIDE RANGE OVEN

No. 128 Wide Range Oven provides wide temperature range; 300° F. to 2400° F; covers practically every phase of heat treatment. Can be used for annealing, pack carburizing, hardening, preheating, tempering and general heat treating. Ideal for general school use.



### ALL PURPOSE FURNACE

Triple Purpose D, illustrated at right, is a combination pot, oven and forge furnace. Can be used for oven furnace hardening—lead, salt or cyanide hardening—lead, salt or oil tempering—forging, welding, tool dressing—annealing, normalizing, pack carburizing—non-ferrous metal melting. Also available in other combinations.

Sunbeam also builds a companion Charcoal Generator and 450° F. to 2450° F. Electric Furnaces. Information and prices sent immediately.

**Sunbeam EQUIPMENT CORPORATION**
Dept. 129, 180 Mercer Street, Meadville, Pa.

## Foundry Supplies

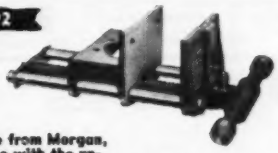
Molding Sand, Crucibles, Tongs, Flasks, Molders' Tools, Ingot Metal, Bellows, Pattern Letters, Dust Bags, Pyrometers, Riddles, Bottom-Pour Ladles, Goggles, Asbestos Aprons, Leggings, Gloves, etc..

**"SPEEDY-MELT" Furnaces** **"SPEEDY-FORGE" Forges**

**Western Materials Company**
39 South LaSalle St. *Equipment Division* Chicago 3, Illinois

First in Schools Since 1892

# MORGAN



Choose from Morgan, the vise with the unconditional guarantee without time limit restrictions. Choice of complete range of sizes and types with Morgan's Woodworkers' (with solid aluminum handle), Machinists', Pipe and Combination Pipe Vises. When ordering complete bench unit from bench mfr. specify Morgan Vises.

*Send for complete Catalogue*

**MORGAN VISE COMPANY**
112 N. JEFFERSON ST.
CHICAGO 6, ILLINOIS

# NOW...

## SCHOOL SHOP LUMBER WITH GUARANTEED QUALITY

**CUT YOUR WASTE FACTOR TO A MINIMUM!**

**GET MORE USABLE BOARD FEET IN YOUR SCHOOL SHOP LUMBER!**

When you buy HARCO lumber, you get *guaranteed quality*—lumber that is guaranteed as to species, seasoning, texture and grade.

You get the kind of School Shop lumber that assures maximum usability and minimum waste.

Our hardwoods grow in the Great Smoky Region of the Appalachian Mountains — America's finest. We accumulate lumber for school shops through a continuing program of texture-selection. We know the quality you need, properly kiln-dry it, and store it for school shop orders.

All lumber is carefully packaged and shipped direct from mill to your school via truck transports.

Get HARCO *guaranteed quality!* Get *more* usable board feet in every order! . . . Let us quote on your requirements.

**READY-TO-SHIP ITEMS**

| | | | |
|---|---|---|---|
| ASH | CHERRY | POPLAR | WHITE PINE |
| BALSA | CHESTNUT | RED CEDAR | WILLOW |
| BASSWOOD | LIMBA | RED OAK | BIRCH DOWELS |
| BEECH | MAHOGANY | WALNUT | DRAWING BOARDS |
| BIRCH | MAPLE | WHITE OAK | PLYWOODS |

BALL BAT BILLETS TURNING SQUARES

**SAVE MONEY ON OUR DELIVERED PRICES**

If your school is in a state east of the Mississippi, or in Arkansas, Kansas, Louisiana, Missouri, Oklahoma or Texas—we can save you money! See our catalog 1958-S for delivered prices. Catalog sent FREE on request, postpaid.

**HARDWOOD CORPORATION OF AMERICA**

EDUCATIONAL LUMBER DIVISION
P. O. Drawer 1091, ASHEVILLE, N. C.

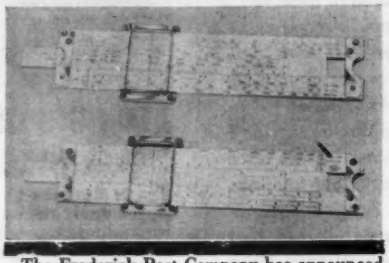

Company and the address will be Berkroy Products Company, 1171 E. 32nd St., Los Angeles 11, Calif.

King has also added two power hack saws to its line: the No. 2 Standard Saw and the No. 3 Standard High-Speed Saw.

Specifications show No. 2 will take stock up to 4" x 4", and No. 3, up to 6" x 6"; No. 2 has a 12" hand-type blade, No. 3, a 14" power blade; No. 2 has a ¼-hp, single-phase motor, and No. 3, a 1/3-hp motor.

For additional information write to the King Mfg. Co., 1171 E. 32nd St., Los Angeles 11, Calif., mentioning SCHOOL SHOP; or *circle no. F-8 on the business-reply card.*

### Professional Quality Slide Rule Fits Neatly in Shirt Pocket



The Frederick Post Company has announced the development of a compact, efficient slide rule—shirt-pocket size—that weighs 1½ oz., measures 6¾" long, contains 23 scales, and is said to be the answer to the need for an accurate instrument for on-the-spot, rapid calculations.

The rule's construction is patterned after the firm's 10" Versalog. It is overlaid with snow-white celluloid on which the 23 scales are engine-divided. The company claims that the rule never needs lubrication due to sealed-in silica and it also resists warpage to a high degree. The scales are color coded.

For more information write to the firm at 3650 N. Avondale Ave., Chicago 18, Ill., mentioning SCHOOL SHOP; or *circle no. F-9 on the business-reply card.*

## *New Literature:*

**Catalog B** is the new 12-page catalog published by Berger Scientific Supplies, Inc.

It contains information about drawing sets, scales, slide rules, and other drafting tools for every grade level of instruction. Catalogs are free on request by writing to the firm at 37 Williams St., Boston 19, Mass., mentioning SCHOOL SHOP; or *circle no. F-10 on the business-reply card.*

**Catalog "W"** is a 112-page catalog of shop and mechanic's hand tools now available from Snap-on Tools Corporation. Well illustrated, the catalog contains full details on the wide range of Snap-on tools including all tools and test equipment needed for complete automotive service. For a copy write Snap-on Tools Corporation, 8028 28th Ave., Kenosha, Wis., mentioning SCHOOL SHOP; or *circle no. F-11 on the business-reply card.*

**Torit Dust Collectors for the School Shop** is a new four-page brochure published by Torit Manufacturing Company which describes the advantages of dust collectors and gives details on their operation. For a copy write to the manufacturer, Walnut and Exchange Sts., St. Paul 2, Minn., mentioning SCHOOL SHOP; or *circle no. F-12 on the business-reply card.*


**PLAY IT SAFE . . . *with the* GS No. 9000 GOGGLE**

No. 9000 — Clear No. 9100 — Green

**FOR SHOP AND LABORATORY**

This featherweight one-piece goggle fits all faces—men and women alike. Optically perfect and molded to .060" thickness, lenses are impact-resistant and afford protection for light grinding, spot welding, and other semi-hazardous operations. May be worn over prescription glasses. Handsome styling ends complaints about ugly, cumbersome goggles—everyone will want to wear them!

PRICES FOR NO. 9000 AND NO. 9100:

| 1 to 11 doz. | 12 to 35 doz. | 36 doz. or more |
|---|---|---|
| $7.20 per doz. | $6.60 per doz. | $6.00 per doz. |

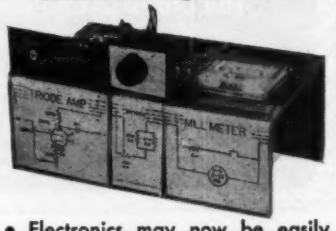
OPEN ACCOUNTS INVITED

For Everything in Safety Equipment, Write for Catalog #10

GENERAL SCIENTIFIC EQUIPMENT CO.
7520 Limekiln Street
PHILADELPHIA 50, PA. HAncock 4-1550

**ELECTRONIC LEARNING ACCELERATED**

**New Technique Keeps Pace With Technological Advances**



- Electronics may now be easily integrated into ANY industrial arts, science, or industrial program.
- Simplified instructional technique minimizes instructors time.
- Student learning stimulated through accelerated achievement.
- Instructors supervision minimized.
- Complete laboratory electronics course can be taught without the expense of a tool room.
- Ideal for large classes (above 25)

*Free literature and consultation available, write to—*

**ELECTRONIC AIDS, INC.**
2118 St. Paul Street Baltimore 18, Md.

# WHY SHOP TEACHERS BUY ROC-EDGE BLADES

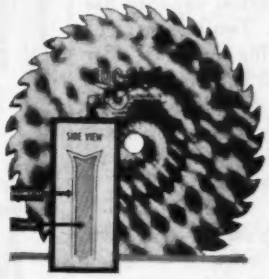
Re-sharpening blades is not practical, because the hardness is sharpened off the blade, and cuts only a fraction of the time of a new blade.

**ROC-EDGE** patented hardchrom process guarantees longer life, and the price is the price of re-sharpening.

**ROC-EDGE** is longer lasting, free cutting. Its sabre tooth gives you an exceptionally smooth finish.

***Look at these Retail Prices***

| | |
|---|---|
| 10" | $1.89 |
| 9" | 1.79 |
| 8" | 1.69 |
| 7" | 1.59 |
| 6-6½" | 1.49 |
| 4-5½" | .98 |

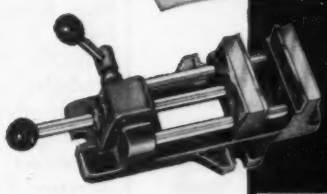



***There are 400 Warehouse Distributors and 23,000 retail dealers in the U.S. to service you.***

**ROCCO PRODUCTS, Inc.**
2916 Fourth Ave. So. • Minneapolis, Minn.

# THE FIRST WIDE RANGE DRILL PRESS VISE

*that safely handles both rigid and non-rigid work without distortion.*



THE LW

A precision built device designed to cut tooling costs and increase production.

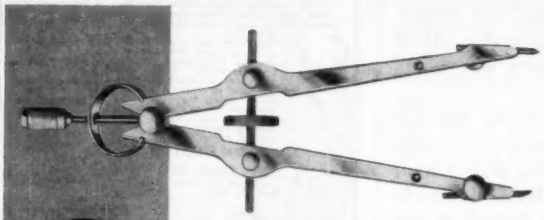
Heavy 4" wide removable jaw inserts allow simple, quick adaptation for low cost jigs and fixtures. 5½" opening. Easy hand pressure on hardened and micro-ground bar locks and holds the work fast.

**ADJUSTO/QUICK CONTROL**
**4" DRILL PRESS VISE AND FIXTURE HOLDER**
**$31.50**

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

**L-W CHUCK COMPANY** 69 SO. ST. CLAIR ST. TOLEDO 4, OHIO

**VEMCO**



# *Stainless* STEEL COMPASSES *at a new low price*

The famous VEMCO stainless steel Blue Dot compasses are now available at a lower price, but with the same fine quality and precision performance. And remember, American made VEMCO compasses are produced by modern manufacturing processes, which permit the use of durable steels not found in handmade instruments.

**SPECIAL SCHOOL CATALOG ON REQUEST**

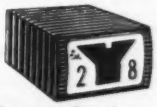
**V. & E. Manufacturing Co.**
*Department ST-1*
*P. O. Box 950-M*
*Pasadena, Calif.*

VEMCO

# *Southern* SCREWS AND BOLTS CAN MAKE A BIG DIFFERENCE

in the quality and strength of your workshop projects.
Southern's wide variety of Phillips or slotted fasteners with accurate threads plus uniform strength offers easy application, tight holding power.
Teachers know that basically good instruction depends on the kind of methods used. They also know that sound classroom projects depend on quality fasteners; and for quality fasteners, depend on Southern!

**Sold Through Leading Hardware and Building Supply Dealers**




Wood Screws • Tapping Screws • Machine Screws • Dowel Screws • Drive Screws • Stove Bolts • Carriage Bolts • Hanger Bolts

# CERROTECHNICS

## —a useful technology for the school shop

THE term Cerrotechnics refers to the technology of using bismuth alloys (Cerro* Alloys) in industrial operations. Some 63 different uses of these alloys are now known—most of them in metal-working projects.

The characteristics and applications of Cerro Alloys are easy to teach in class room or school shop. Thus the student acquires practical know-how of a wide range of useful industrial projects in a short time. Most of the equipment required can be improvised or is obtainable from local hardware stores.

CDeP For the complete listing of 63 CERRO ALLOY applications, send for our new information-packed "HOW TO" (No. J4) booklet.

**CERRO DE PASCO SALES CORPORATION**

300 Park Ave., Voc. Ed. Dept., New York 22, N.Y.
*T. M. Cerro de Pasco Corporation

Handy DIRECT READING caliper has built in black-on-white scale marked in 32nds. Reaches 3" in from edge of work. Spring action permits one-hand operation. Thumbscrew locks caliper for use as a gauge. INSIDE caliper also available.

**EVERY SHOP STUDENT NEEDS ONE**

***Special price to schools**

Regular price $2.50 each. Schools, teachers, students buy either model at $2.00, both models for $3.75, or $1.70 each in lots of 3 or more. Send school purchase order, personal check, or cash with order. We pay postage. Satisfaction guaranteed.

MASTER Specialty Co. Inc.
3724 Monitor Ave. Minneapolis 16, Minn.


## Washington . . . . *from page 60*

cles, let's note that industrialists now inventory stockpiles of coal or gravel from the air using aerial photographs; liquid plywood glue is now being hauled in giant rubber bags on flat-bed trucks; and aluminum is being sold in molton form, by the buckets. And we have been keeping this item as the last because it represents the convolutions going on in industry. The metal-working industries are using fewer tools and producing more work. Since 1953, the total number of machine tools in metal-working industries has dropped about 10 percent; yet industrial capacity has increased 40 percent. Two reasons: (1) The industry is junking machines older than two decades and is replacing them with machines that are more productive. (2) The industry is installing multi-station machines which can perform up to 100 different operations.

**Technological Progress.** — The year 1958 was a year of economic recession —but the productivity index was anything but in a recessive line. On the contrary, during the third quarter of 1958 productivity took a sensational leap—a gain of output per man-hour of more than ? percent over the previous quarter. Although economists and industrialists described this three-month performance as "fabulous," the longer-term trend was in that direction. As of March, 1958, U.S. industry was where it expected to be in 1962.

What were the reasons for this UP trend? Are workers better trained, more efficient? The truth is that skilled labor gets only a teeny-weeny bit of the credit for higher productivity, though it certainly gets some. We have been talking to an industrial expert and he tells us that productivity can be affected by at least seven factors. Innovations, management, finance, labor skills, the economic or political climate, government policies, and even such natural factors as weather or the depth of mineral deposits—all these can affect productivity. In Communist or Nationalist China, for example, hordes of unskilled but zealous laborers are rolling up huge produc-


World's Best Source of Supply
for INDUSTRIAL ART DEPARTMENTS of SCHOOLS and INSTITUTIONS

Get this big new manual of "hard-to-get" items for furniture and cabinet-making, antique restoring, and industrial arts. Rare and imported woods, 120 kinds of veneers, inlays, carving blocks, turning squares, clamps, all kinds of hardware, table legs, professional wood finishing materials, inlaid picture kits, mouldings of all kinds, ornamental hardware, hand and power tools. Upholstery supplies, woodworking plans, instruction books, and 1001 other items. Free to teachers (others 50¢ — refunded on 1st order).

Send for Catalog TODAY!

ALBERT CONSTANTINE and SON, INC.
2064 Eastchester Road, New York 61, N.Y.



SPEEDY-FORGE

Gas-fired; will use any type gas; manufactured, mixed, natural, bottled, cylinder.

Clean, Fast, Instant Heat
Smokeless
Odorless

No. F-100-A Blower, Hood, Solenoid Valve

Developed and tested by shop instructors.

*Write for sizes and prices on Speedy-Melt Furnaces and Forges.*

McENGLEVAN
Heat Treating & Mfg. Co.
708 Griggs Danville, Ill.



Instructors

COMPLETE KITS + SUPPLIES
LEATHERCRAFT
METALCRAFT
WOODBURNING
CORKCRAFT
RUBBER MOLDS
SHELLCRAFT
BRAIDING
GLASS ETCHING
FELTCRAFT
BEADCRAFT
AMBEROLCRAFT
BLOCK PRINTING

We supply complete materials, tools, patterns and simple step-by-step instruction books that help to supplement your own personal instruction. Hundreds of new ideas, projects and designs all clearly illustrated in our big catalog. Now low prices on all craft supplies are now in effect. Write today for your copy of our complete catalog . . . without charge . . . simply request it on your school letterhead.

DEARBORN LEATHER CO.
Dept. SS-2
8825 Linwood Ave.
Detroit 6, Michigan

NEW LIGHT WEIGHT SHOP COATS

Especially designed for comfort and long service — sturdy fabric — Button Front — Sanforized — Micrometer Pocket—Extra Breast Pocket.
Attractive Gray Color.
Sizes 36, 38, 40, 42, 44, 46.

ONLY $5 each 2 for $9 — 3 for $13

Write for Free Folder describing other style coats & shop aprons at bargain direct-from-mfr. prices.

SCHOOL PRODUCTS CO., Manufacturers
Dept. K, 330 E. 23rd St., N.Y. 10



Ceramics-Mosaic
Copper Enameling

Your complete source of materials & equipment. Fully illustrated.
INSTRUCTIVE CATALOG
FREE if requested on school letterhead (others 25c)
TEPPING STUDIO SUPPLY CO.
professional staff
3517 Riverside Dr. Dayton 5, Ohio

tivity under the spur of wanting to overtake England and the U. S. And in the United States, productivity rose during 1958 because of technological progress in many industries and because heavy capital investments backed up the work force with more machinery and power.

**More Research and Development.**—There is still another reason for rising productivity and it is what industrialists glibly term research and development. "Now is the time to research and develop those products we are going to need in future years," has become almost as much of a shibboleth as "Now is the time for all good men to come to the aid. . . ."

Research, of course, means setting men free to think, and dream, and try, and make mistakes, and create something that did not exist before. Some of the large industries spend hard dollars for just such activities. Others set up a budget for research, but use the money for trouble shooting, process control, product improvement, or just plant improvement. All in all, something like eight billion dollars was spent last year for industrial research and development. There is hardly an industrialist who would charge this to be money wasted. In fact, even those industries which pay only lip service to research declare that at least 2 to 4 percent of sales dollars should be plowed back into research. And when 3205 executives were asked by the NAM what they plan to do about research and development budgets for 1959, more than one-third said they'd raise them, and nearly all the rest said they'd keep the budgets the same as in 1958.


**Ideas unlimited!**

Successfully tested and approved for project activities in plastics, ceramics, leather, wood, metal!

**New Catalog**

now available of handsome desk and project accessories — desk fountain pens, desk ball pens and pencils, swivel-funnel-holders, plus many new items.

Combination shown at right priced at $5.70 a dozen up for pen, funnel, swivel, screw.

**Gilbert & Miller INC.**

404 FOURTH AVE., NEW YORK 16, N.Y.

Pen Makers to the Trade Since 1837

CAN-PRO

INDUSTRIAL ARTS

APRONS & COATS

APRONS: APPROVED BY PARENTS
Dress your class in uniform protection.
ECONOMICAL
APRONS ARE A NECESSITY
Shop Organization Plan.
Full cut aprons, expertly constructed, 4 colors - 4 sizes. Plus BONUS APRONS. Details, material samples in Circular 23.

WRITE FOR CIRCULAR NO. 23

COATS: 2 Distinctive Styles
Expertly tailored. Top quality material. Designed exclusively for the Industrial Arts Teacher. In 5 colors. Details, material samples in Circular 23.

"The School Apron Folks"

CAN-PRO Corporation
23 EAST McWILLIAMS ST
FOND DU LAC, WISCONSIN

BUILD YOUR OWN!
FROM BOATS TO TIE-RACKS

Knockdown units made of genuine Tennessee aromatic red cedar and other woods

*New 4-color catalogue offers dozens of challenging "do-it-yourself" items*

*Write:*

GILES & KENDALL CO.
Box "D" Huntsville, Alabama

DO IT YOURSELF

*Mosaics*

Imported ceramic or glass tiles make beautiful mosaic designs.

OVER 200 FULL SIZE PATTERNS and DESIGN IDEAS:

- Tables
- Lamp Bases
- Picture Frames
- Wall Plaques
- Book Ends
- Mirrors
- Window Sills

Illustrated instruction and idea catalog.

Modern Mosaics Division

you the Booklet listing over 200 Patterns and the catalog FREE.

FOR ENAMELISTS!

Kiln and Hundreds of Projects in our

ENAMEL-on-COPPER IDEA BOOK

- New Ideas for Copper and Complete Jewelry Findings for Ceramists.
- Many new Classroom Projects.

Your Idea Book and Kiln Information will be rushed to you.

The Copper Shop Division

IMMERMAN & SONS

Dept. MC-30, 1924 Euclid Ave., Cleveland 15, O.

Specially Designed for Student Safety!

*Baldor* BUFFERS

Baldor "safety engineered" buffers meet the diversified demands of young, inexperienced hands. Slow speed (1725 RPM) reduces spoilage —makes learning so much *easier . . . faster!* Helps students do better work. Ideal for soft metals, cellulose materials, plastics. Conventional 3450 RPM also available. Feature for feature, no other buffer offers so much.

- Even under extreme and repeated overloads, motors won't burn out!
- Flanges, wheels, shafts comply with American Standard Safety Code requirements!
- Lubricated for life ball-bearings!
- 6", 7", 8" and 10" sizes!
- NEMA construction!

*Write for Bulletin 321P on complete line of Baldor Grinders and Buffers!*

BALDOR ELECTRIC CO.

4353 Duncan Ave. • St. Louis 10, Mo.

—WOODSHOP INSTRUCTORS—

Have you heard about

*Magna-Set?*

• • • • • • *the magnetic Jointer and Planer knife-setter that is rapidly outmoding and replacing the old, mechanically inaccurate, time-consuming straight-edge method!*

The necessity of tapping, prying and re-adjusting is entirely eliminated! Thousands now in use! Write for complete information and name of your nearest distributor.

U.S. Pat. No. 2,889,865

MAGNA-SET COMPANY Dept. SS

632 NEW HAVEN AVE., MILFORD, CONN.

CARVING TOOLS

HOBBYCRAFT SETS

IMPORTED FROM GERMANY

Complete line of Chisels, Gouges & Parting Tools in Straight, Long Bent, Spoon, Back Bent & Fish Tail. Over 30,000 Tools in Stock. Many Special & "Hard to Get" Items. Low Prices. Liberal Discounts to Schools & Dealers.

BIG 8 PAGE FOLDER FREE. Write To-Day.

FRANK MITTERMEIER (Est. 1936)
3577 E. Tremont Ave., New York 65, N.Y.

UNIQUE FINISHES and CRAFTS

DonJer's NEW SCHOOL CATALOG

PRE-TESTED NEW IDEAS FOR SCHOOL SHOP PROJECTS

EVERY DonJer PRODUCT is PRACTICAL, USEFUL and FITS into your CURRICULUM

WRITE FOR YOUR FREE COPY

| | | |
|---|---|---|
| "SUEDE-TEX" | SILVERPLATE | METAL CRAFT |
| LATEX MOLDS | Liquid MARBLE | DESIGNS |
| Liquid LUCITE | PORCELIZING | Liquid FOAM RUBBER |

MANY OTHER PRACTICAL ITEMS based on the advice of hundreds of teachers

DONJER PRODUCTS COMPANY
1398 UTICA AVENUE, BROOKLYN 3, NEW YORK

PACKAGED SETS HARDWOOD FURNITURE LEGS

- Swivel Ferrules
- Two-Way Plates

| Size | Per Set of 4 | Weight per Set |
|---|---|---|
| 6" | 1.99 | 1¾# |
| 9" | 2.33 | 2¼# |
| 12" | 2.65 | 2½# |
| 14" | 2.99 | 2¾# |
| 21" | 3.32 | 4# |
| 28" | 3.66 | 4¼# |

GLOBE BOX COMPANY
Box 19424 Houston 24, Texas

SWITCH TO THE MODERN WAY TO MAKE SILK SCREEN STENCILS.

Let Your Silk Screen Program Come Alive.

Introduce And Use AQUA MAGIC

SEND TODAY FOR FULL INFORMATION OR— Order the complete Introductory Kit —Includes stencil compound, printer unit and paints—$14.95

LEEDS SWEETE PRODUCTS, Inc. 362 W. Erie St., Chicago 10

What's Your Interest?

ALL-CRAFTS "SUPER-MART"
Free Catalog—102 Big Pages

Prompt service on every craft need. Leathercraft, Metalcrafts, Enameling, Woodenware, Mosaic Tile, Ceramics, Art Supplies, many others. Since 1910. Write for free catalog today. Dept. SS-2.

SAXCRAFTS (Division of Sax Bros., Inc.)
1111 N. 3rd St. Milwaukee 3, Wisconsin

VALUES FOR THE SCHOOL SHOP

DRAFTING MACHINE For engineers, draftsmen, designers, architects. Portable. Complete with 11 in. x 17 in. hard surface drawing board with scale divided in 50ths to inch and 180 deg. protractor. This unit is not a toy, it's the real McCoyl NEW. While they last—$10.95 ppd. U.S.A.
Same as above with 10 in. x 13 in. drawing board—$8.95 ppd.

MAUSER-TYPE VERNIER CALIPER 6" Vernier Caliper. Glass hardened, lapped measuring surfaces. Fine engraved scales—1/1000" and 1/128". 2 gib adjustments. Friction thumb release. Reg. $25. Only $7.95.
SATIN CHROMED IN VELVET LINED CASE. All hardened. World's finest. $10.00.
HELIOS TOOLMAKERS VERNIER CALIPER—Scales 1/1000" and 1/128" graduations. Boil thumb lock. A $55 value. Now, $9.95. Leather carrying case for caliper—$1.

FREE CATALOG containing 1000's of bargains in war surplus. 100's of pictures. Calipers, micrometers, squares, hydraulic pumps, instruments, etc. Request catalog on school or commercial stationery.

AIRBORNE SALES CO., INC. DEPT. S-259
8501 Stellar Drive, Culver City, Calif.

**Industry Trains.**—A couple of years ago two college professors became interested in the educational activities of industrial corporations. They spotted about 300 companies (most of these fell into the "largest" industries-of-America class) which offered courses within the factory fence. These ranged from subjects having to do with the company's product to those dealing with technical and cultural themes. The two professors, Harold F. Clark and Harold S. Sloan, summed up their findings in 138-page book titled *Classrooms in the Factories*, and subtitled, "An account of educational activities conducted by American industry."

From the 300 companies studied, the two professors generalized that "factories today have classrooms. . . . The classrooms are often superbly equipped with the latest model blackboards, projectors, sound-recording devices . . ."

The authors reported that corporation educational programs have almost burst into existence during the past ten years; (they) "are still in a dynamic state." Companies use correspondence courses, formal lectures, informal discussions, coaching of subordinates, orientation activities for new factory workers. Courses deal with managerial and supervisory duties; with human relations; and with technical skills. Many are on a high level and cover electronic computer design, instrumentation, machine design, computer principles, advanced propulsion, and creative engineering. Not a few factories offer general education, including foreign languages, economics, and psychology. General Electric alone offers 1500 courses to 32,000 employes at a cost of close to $40,000,000 a year.

The two researchers gathered enough facts to prompt them to say, "It is possible we are now witnessing . . . the birth of a third great educational force of far-reaching consequences." (The first two being the elementary and secondary schools.) "This third innovation is adapting civilization to a new technological era, the ultimate consequences of which stagger the imagination."

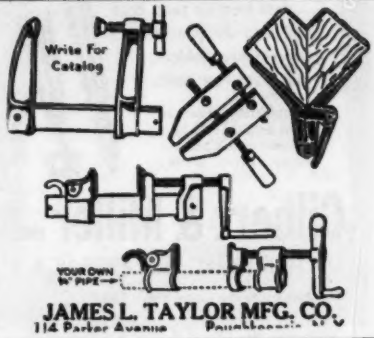
**Educational Obsolescence.**—Having wandered this far off our regular Washington beat, and the coverage of vocational education, we might well continue. And so we meet Dr. Margaret Mead, the anthropologist, who frequently brings a fresh idea to ingrown institutions. This month she suggests that industry has a special role in modernizing our present educational system. She says that industrialists know the real meaning of obsolescence—the junking of outdated

SEE OUR NEW CATALOG

PLASTICS
for Industrial Arts

A complete source of supply. Jewelry findings—dyes, glues—Buffs, Tools, Beondeggle, Fiberglas, manuals, project ideas. "A small firm, with 10 years of personalized service to teachers." Low wholesale prices, fast service, satisfaction assured.

Plastic Products Co., of Utah
P.O. Box 1415 987 East 9th South
Salt Lake City 10, Utah
Frank Dolvin, Manager




JAMES L. TAYLOR MFG. CO.
114 Parker Avenue Poughkeepsie, N.Y.

SHOP TEACHERS

Complete stock of lamp parts for your lamp projects shown in our catalog. Also contains charts and instructions for building and wiring lamps. These valuable instructions and catalog sent for 25c.

GYRO LAMP & SHADE CORP.
34385 N.W. 54th St. Miami, Florida

CRAFT SUPPLIES

| | |
|---|---|
| Leathercraft | Mosaic Tile |
| Copper Enameling | Metal Tooling |
| Beadcraft | Shellcraft |
| Art Materials | Floral Supplies |

Many other crafts
Write for Big Free Catalog Today

KIT KRAFT Depc. BH9, Studio City, Calif.

PLASTIC ITEMS

Boxes, letters, balls, sheets, rods, etc. Also findings for craft classes and custom fabrication.

Discount to Schools

PLASTIC NOVELTIES
5309 Murdoch St. Louis 9, Mo.

CHAIN MORTISER
Bench Model
Send for catalog
No obligation

U.S. Cutting Chain Mfg. Co.
Brockton, Mass.

A Complete Ceramic Service for Schools Ceramics is our only business. We handle a complete line of kilns, wheels, tools, clays and glazes. Our many years experience qualifies us to help you set up and supply a ceramic course for your school or community.

Activities in Ceramics — A Ceramic Textbook, $1.50
Send for our new large 1950 catalogue of ceramics and copper enameling supplies. Complete with instructions. Free.

Seeley's Ceramic Service
7 Elm Street Oneonta, New York

Better Proofs—Buy Nolan

PROOF PRESS

Write for Bulletin

NOLAN Corporation
Dept. SS Rome, N.Y.

**The ONE and ONLY**
**SELF-CENTERING**
**DOWEL DRILL GUIDE**

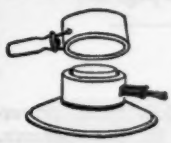
No guesswork with the Wellman "Dowl-it". Perfect automatic centering and alignment of dowel holes in 5 drill sizes. School shop tested and approved. Heat treated drill guides. 2" jaw expansion.

Only $8.95 POSTPAID

Write for FREE Literature Dept. SS-29

**"Dowl-It" Company**
515 N. Hanover St. — Hastings, Mich.

**LOW COST KILN!**



. . . for beginners or professionals. Fires pieces up to 4⅜" diameter and 1½" high. Reaches enameling temperature quickly.

**LOOK TO THOMPSON**

. . . for all your metal enameling supplies. Kilns, metals, enamels, glaze paints, findings and projects are illustrated in our catalog.
Write Dept. SS for New Free Catalog

**THOMAS C. THOMPSON COMPANY**
1539 Deerfield Road Highland Park, Ill.

**LUMBER FOR SCHOOLS**
Also Plywood and Dowels
Write for our new free catalog
**T. A. FOLEY LUMBER CO., INC.**
*Box 336, Paris, Illinois Established 1887*

Safe • Simple • Efficient
**METAL REMELTER**
*Used by Printers from Coast to Coast*
Get Details
**NOLAN Corporation**
Dept. SS—Rome, N.Y.

**Antique TELEPHONE**
**OAK WOOD**
Decorative Piece or for conversion to Radio!
**$9.00 Each**
Shipments FOB Simpson, Pa.
**TELEPHONE ENGINEERING CO.**
Dept. TZ29 Simpson, Pa.

**CASTINGS for PROJECTS**
to TEACH Metal & Machine Shop Skills at all levels.
Used by over 3000 Schools in 48 States and 7 Foreign Countries.
*Send for free Catalog*
**CASTING SPECIALTIES CO., Thiensville 6, Wis.**

**PAPER DRILLING**
*Is Fast and Easy on a*
**PIONEER DRILLER**
*Literature on request.*
PIONEER-TOLEDO CORPORATION
1130 Nebraska Ave. Toledo 2, Ohio

**CLOCKS** That make worthwhile projects—please parents—make excellent exhibit pieces—designed by engineers and satisfying school folks for over 40 years—
**Kuempel Chime Clock Works**
11 Kuempel Bldg. Minneapolis 16, Minn.


machines and processes is, after all, an everyday occurrence in shop and factory. Hence, says Dr. Mead, industry should take the lead "in highlighting the obsolescence" of school offerings. (While she does not mention trade and industrial education by name, she most certainly implies that nearly all of vocational education suffers from a high degree of obsolescence.)

But that is not enough, according to Dr. Mead. Industry will never become the great educational force it should be until Americans give up the notion that the factory is a monstrous and wicked institution, bent on sweating and exploiting young people unless they are protected by the public school and compulsory attendance laws.

And Dr. Mead would go further still. She would like to see industry take over the education of those who cannot gain anything by remaining in school. "We need to recognize there are other routes to competence than the one provided by the conventional school," she says. "We should recognize that the adolescent's right to work is as great as his immediate need and right to study."

To round out this reporter's look at industry's relation to life and schooling, we need point out only one more thing: the person who works in modern industry is in the vortex of a great educational force. Industry in 1959 is not only a force that creates wealth and power, but it is also a force geared to change, a force that demands creativity, a force that compels continuing learning for those who are to be a part of it. ★

**Editor's note: Next month Michael Paca returns to his regular reporting of educational events on the Washington scene.**

*Time is Fleeting!*
Send in your Shop Teachers Service slips today. The deadline is February 28, 1959.


**KNOCKDOWN CEDAR CHEST**
**and Aromatic Red Cedar Lumber**

Write for Free Price List Today •

**BEDFORD LUMBER CO.**
SHELBYVILLE, TENN.

**KASENIT COMPOUND**

For CASE HARDENING OF ALL TOOLS, COMPONENT PARTS, MACHINERY, etc.
Easy to Use—Needs No Special Equipment — NON-Poisonous— NON-Explosive— NON-Inflammable
AVAILABLE DIRECT OR THROUGH YOUR MILL SUPPLIER
In 1, 5, 10, 25, 50 and 100 LB. CONTAINERS
SPECIAL OFFER 1-lb. Can Postpaid $2.50
Mail order for Complete "How to Use" Instructions
**KASENIT CO.** (EST. 1912) 12 KING ST. MAHWAH, N.J.
*MONEY BACK GUARANTEED—(FOLDER FREE)*

FLO-STAIN **Quality Stain**
Durable, easy to handle . . . Enhances and protects surface.
FLO-PAQUE **Quality Colors**
53 Colors—including 18 non-tarnishing metallics.
*Write for circular*
**FLOQUIL** Dept. 59-S, Cobleskill, N. Y.

**ELECTRIC CLOCKS**
For Wood, Plastic Cases, Cabinets, etc.
Self-starting Fitup, No. T3-B, 3⅝" dia.; 1⅝" to 1-11/16" depth. Other sizes. Send for free folder, SS-2.
**LANSHIRE CLOCK & INSTRUMENT CORP.**
7548-58 S. Loomis CHICAGO 20

*Maid-o'-Metal* **CRAFT METALS and SUPPLIES**
*it's Fun! it's Easy!*

**FREE FOR YOUR ARTS & CRAFTS PROJECTS:**
HOW-TO-Booklet and MEMOS . . . Idea-packed brochures of illustrated directions and low-cost projects particularly suitable for your class work. Included are directions for Etching and Tooling beautiful Trays, Placques, Planters . . . . simple Wiggle Engraving of Designs, Lettering, Monograms . . . . etching with a cold-water solution . . . Designing on colored aluminum pieces, etc.

CATALOG for single mail-order source of craft metals and supplies including many new Pre-formed and Colored items — Wiggle-Engravers, Bracelet Blanks and Benders, Tray Handles, etc.

Maid-O'-Metal ALUMINUM • BRASS • COPPER — Circles, Rectangles, Foil, Supplies are carefully prepared and selected for ETCHING, TOOLING, ENGRAVING and ENAMELING. Subject to relatively simple processes, they bring ease and assurance to your craft-work, and for 10 years have been the best suited to your requirements.

Cultivate the further enjoyment of your Arts & Crafts program. Review and try these new Maid-O'-Metal aids, ideas, and items — available at your local dealer. Or write us for this free Maid-O'-Metal literature, including direct mail-order information.

ST. LOUIS CRAFTS, INC. DEPT. SS5, ST. LOUIS 19, MO.

# from Washington

*by Michael Paca*

**From Corn to Wood Stretchers.**—Two corn cribs on an Indiana farm hold under their aluminum roofs a new type of corn. The new strain, called amylomaize, contains a starch with a heavy dose of amylose. Now, amylose is a cousin to cellulose, and this kinship gives the new type corn (still under study on the Indiana farm) its potency. Out of this corn will come film, fibers, furniture finishes, and transparent wrappings.

The fact that the corn is still in an experimental stage or that the products that can be derived from it are not yet in mass production does not minimize its importance. Within a year or two, as American industry touches it with its magic wand, amylomaize will be an important ingredient in the future's well-being.

We took note of amylomaize not because it is unusual, but because it contains the elements of what is happening almost daily in American industry. New materials are being developed, which in turn make products which are new, or are better, or can be produced in greater abundance at less cost.

Examples of what we have just set forth above can fill an encyclopedia. A crucible steel company announces a new titanium alloy, claiming it to have the best strength-to-weight ratio of any structural material in the world. Another industry announces the development of a wood stretcher, once considered a will o' the wisp, but now a practical means for keeping wood from warping. Chemists reveal they know how to turn the by-products of crude oil refining into fiber-forming materials and the result will be more plentiful and cheaper material for clothing.

We can't resist listing a few more items of similar ilk: in the planning, production, or marketing stages are batteries that last ten times as long as those made ten years ago; glues (those marvelous new glues!) that hold faster; building materials whose honeycomb construction make them 16 times stronger than steel but light as cardboard; and TV sets so thin they can hang on walls like a picture. It is not within the scope of this dispatch to touch on the thaumaturgy of automation, jet propulsion, electronic computers, or semiconductors.

During December of last year, more than 3000 manufacturers were asked: "What are the principal economic forces that work for expansion in your industry?" The answer most often mentioned: new products.

(In the interest of completeness, let's record the fact that this survey was made by the National Association of Manufacturers. The NAM asked its 3212 members to answer seven questions, one of which dealt with the forces working for expansion. Twenty-seven percent of the industrialists placed "new products" first; while an additional 26 percent placed "new products" second on their list. Other forces working for expansion are the growing population and expanding world markets.)

New ways of doing things is also one of the factors working for expansion. Again, at the risk of turning this dispatch into a catalog of industrial mira-

(*Continued on page* 56)

## *Index* TO ADVERTISERS . . .

**Please note: For further information from advertisers use those numbers listed in the column. *"Number to circle on the card."* Circle the corresponding numbers on the enclosed card for those companies listed below from whom you wish product information. You will receive the desired information promptly and without further obligation.**


| *No. to circle on card* | | *Page No.* |
|---|---|---|
| 1 | Airborne Sales Co. | 58 |
| 2 | Allied Radio Corp. | 49 |
| 3 | Alvin Co. | 47 |
| 22 | American Abrasive Metal Co. | 23 |
| 4 | American Electrical Heater Co. | 50 |
| 5 | American Technical Society | 2 |
| 6 | Armstrong Brothers Tool Co. | 53 |
| 7 | Atlas Press Co. | 4 |
| 8 | Baldor Electric Co. | 57 |
| 9 | Bedford Lumber Co. | 59 |
| 10 | Berger Scientific Supplies Inc. | 51 |
| 11 | Berkey Products Co. | 24 |
| 12 | Better Light Better Sight Bureau | 37 |
| 13 | Billings & Spencer Co. | 49 |
| 14 | Boice-Crane Co. | 31 |
| 15 | Borden Co. | 26 |
| | Brodhead-Garrett Co. | 38 |
| 17 | M. L. Campbell Co. | 49 |
| 18 | Can-Pro Corp. | 57 |
| 19 | Casting Specialties Co. | 59 |
| 20 | Cerro de Pasco Sales Corp. | 56 |
| 21 | Chandler & Price Co. | 35 |
| | Chilton Co. | 46 |
| 23 | Cincinnati Tool Co. | 25 |
| 24 | Columbian Vise & Mfg. Co. | 47 |
| 25 | Albert Constantine & Son, Inc. | 56 |
| 26 | Cope Plastics | 47 |
| 27 | Craft Metals Corp. | 50 |
| 28 | Craftsman Wood Service | 27 |
| 29 | Dearborn Leather Co. | 56 |
| 118 | Delta Power Tool Div., Rockwell Mfg. Co. | 43 |
| 30 | Desmond Bros. Paint Co. | 51 |
| 31 | Dockson Corp. | 52 |
| 32 | Donjer Products Co. | 58 |
| 33 | Dowi-It Co. | 59 |
| 34 | EICO | 25 |
| 35 | Electronic Aids, Inc. | 54 |
| 36 | Evans Rule Co. | 27 |
| 37 | Fairgate Rule Co. | 24 |
| 40 | Floquil Products Co. | 59 |
| 38 | Foley Lumber Co., Inc. | 59 |
| 41 | Garrett Tubular Products, Inc. | 43 |
| 42 | General Finishes Sales & Service Co. | 24 |
| 43 | General Scientific Equipment Co. | 54 |
| 44 | Gilbert & Miller Inc. | 57 |
| 45 | Giles & Kendall Co. | 57 |
| 46 | Globe Box Co. | 58 |
| 47 | Goodheart-Willcox Co., Inc. | 3 |
| 48 | Greaves Machine Tool Co. | 20 |
| 49 | Gyro Lamp and Shade Corp. | 58 |
| 50 | Hardwood Corp. of America | 54 |
| 51 | Heath Co. | 34 |
| 52 | Higgins Ink Co. | 39 |
| 53 | House of Plastics | 49 |
| 54 | Huther Bros. Saw Mfg. Co., Inc. | 34 |
| 55 | Immerman & Sons | 57 |
| 56 | Johnson Gas Appliance Co. | 40 |
| 57 | Johnson Mfg. Co. | 36 |
| 58 | Kasenit Co. | 59 |
| 59 | Kit Kraft | 58 |
| 60 | Knempel Chime Clock Co. | 59 |
| 61 | Lanshire Clock & Instrument Co. | 59 |
| 62 | Leeds Sweets Products Inc. | 58 |
| 120 | Logan Engineering Co. | 42 |
| 63 | Lufkin Rule Co. | 30 |
| 64 | L-W Chuck Co. | 35 |
| 65 | Magna-Set Co. | 57 |
| 66 | Master Specialties Co. | 56 |
| 67 | McEnglevan Heat Treating & Mfg. Co. | 56 |
| 68 | McKnight & McKnight | 45 |
| 69 | Frank Mittermeier | 57 |
| 70 | Morgan Vise Co. | 56 |
| 71 | Motor Book Dept. | 44 |
| 72 | National System of Garage Ventilation | 34 |
| 73 | Nolan Corp. | 59 |
| 74 | Nolan Corp. | 58 |
| 75 | Northfield Foundry & Mach. Co. | Cov. 4 |
| 76 | Oliver Machinery Co. | 39 |
| 77 | O'Neil-Irwin Mfg. Co. | 6 |
| 78 | Paco Electronics Co., Inc. | 52 |
| 79 | Parks Woodworking Mach. Co. | 49 |
| 117 | Patterson Bros. | 53 |
| 80 | Peck, Stow & Wilcox Co. | 49 |
| 81 | Philco Tech. Rep. Div. | 5 |
| 82 | Pioneer-Toledo Corp. | 59 |
| 83 | Plastic Novelties | 58 |
| 84 | Plastic Parts | 40 |
| 85 | Plastic Products Co. | 53 |
| 86 | Powermatic Machine Co. | Cov. 3 |
| 88 | Rocco Products, Inc. | 55 |
| 89 | Ruemelin Mfg. Co. | 34 |
| 90 | Howard W. Sams & Co. | 51 |
| 91 | Sax Bros, Inc. | 58 |
| 92 | Geo. Scherr Co. | 53 |
| 93 | School Products Co. | 56 |
| 94 | Science Electronics Inc. | 41 |
| 95 | Seeley's Ceramic Service | 58 |
| 96 | E. H. Sheldon Equipment Co. | 21 |
| 87 | Sheldon Machine Co. | 28 |
| 97 | Skil Corp. | 39 |
| 98 | Skil Corp. | 43 |
| 99 | South Bend Lathe Works | Cov. 3 |
| 100 | Southern Screw Co. | 56 |
| 119 | St. Louis Crafts | 59 |
| 101 | Stacor Equipment Co. | 32 |
| 102 | Stanley Tools | 8 |
| 39 | P. A. Sturtevant Co. | 34 |
| 103 | Sunbeam Equipment Corp. | 58 |
| 104 | James L. Taylor Mfg. Co. | 58 |
| 105 | Telephone Engineering Co. | 59 |
| 106 | Tepping Studio Supply | 56 |
| 107 | Thos. C. Thompson Co. | 59 |
| 108 | Torit Mfg. Co. | 46 |
| 109 | U. S. Cutting Chain Mfg. Co. | 58 |
| 110 | Universal Scientific Co. | 7 |
| 111 | Universal Vise & Tool Co. | 25 |
| 112 | V & E Mfg. Co. | 55 |
| 113 | Wells Mfg. Corp. | 29 |
| 114 | Western Materials Co. | 53 |
| 115 | Western Wood Mfg. Co. | 48 |
| 16 | Wilton Tool Mfg. Co. | 27 |
| 116 | X-acto, Inc. | 46 |

## FOR COMPLETE PRODUCT INFORMATION USE THIS CARD

**SCHOOL SHOP: Please have companies whose numbers I have circled below send me complete product information without further obligation. (This card is good until April 30, 1959.)**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
| 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |

### "News from Industry" Items

Please send me the following items listed in the "News from Industry" section of this issue of SCHOOL SHOP:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 |
| F11 | F12 | F13 | F14 | F15 | F16 | F17 | F18 | F19 | F20 |

Name _____

School _____

School Address _____

City, Zone, State _____

Subjects taught: _____

### Books Worth Ordering

Please send me the book, "Modern School Shop Planning" ($3.85) ..... ☐

Please send me the handbook, "Machinists' Ready Reference" ($1.50) ..... ☐

Above books will be sent for free 30-day examination with return privilege.

2-59

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

**BUSINESS REPLY CARD**

First Class Permit No. 208, Ann Arbor, Mich.

**SCHOOL SHOP**

330 Thompson Street

Ann Arbor, Michigan

# ANOTHER SCHOOL SELECTS

# SOUTH BEND

Safety is extremely important in every school shop. This is one of the many reasons why Nappanee High School, like the many other high schools that have installed South Bend 10K Lathes, find South Bend's safe . . . safe even for the inexperienced students.

On underneath motor drive lathes, an automatic interlock prevents the opening of the headstock and the gear guard while the motor drive is engaged. Another safety interlock makes it impossible to engage power cross feeds and longitudinal feeds at the same time. The belt drive to the spindle is also an important safety feature. In event of tool hang up, the overload is absorbed by the belt and prevents possible injury and serious damage to the lathe.

Mail the coupon for more information about South Bend 10K Lathes . . . and why they are preferred by many shop instructors.

**NAPPANEE**
**High School**

*Prices of 10K Floor Lathes start at $500.*

**SOUTH BEND LATHE**

***Builders of Lathes, Milling Machines, Shapers, Drill Presses, Pedestal Grinders***

**SOUTH BEND LATHE, South Bend 22, Indiana**

Please send information on 10K Lathes

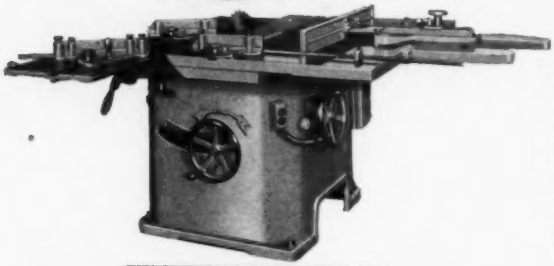
NAME_____ SCHOOL_____

STREET_____

CITY_____ STATE_____

# You'll like *Northfield* woodworking machines in YOUR school shop!

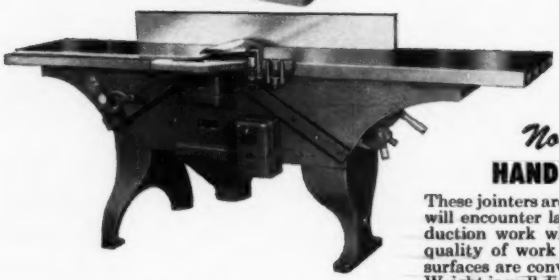
You'll like them for their heavy, vibration-free, smooth running. Each machine is electronically balanced. You'll like their dependability, the freedom from trouble, their excellent safety features. And yes, you'll like the price too. Take all these factors into consideration and compare NORTHFIELD with any others before you buy.



## *The Northfield* NO. 4 VARIETY SAW

**Tilting Arbor Type**

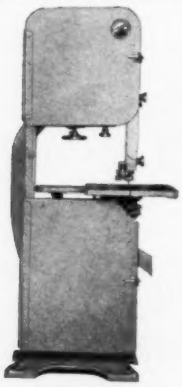
The NORTHFIELD No. 4 Variety Saw is a carefully designed, quality machine with the latest features. It offers maximum versatility for all around sawing in any school shop. In addition to wood it's adaptable for cutting light metals, plastics, and other materials. The table on the basic machine is 44″ x 36″, plus a 19½″ extension for carrying the rip gauge table. One or more 12″ table extensions can be furnished to increase table size. A rolling section table is also available. You'll like this machine for its versatility, heavy duty capacity, ease of handling, and speed with precision.



## *Northfield* HAND JOINTERS

These jointers are of the type the student will encounter later being used for production work where accuracy and fine quality of work are essential. Working surfaces are convenient to the operator. Weight is well distributed to make a well balanced smooth operating machine. The medium duty machine at right is available in eight and twelve inch widths. Tables are 6'2″ long; rabbet depth ⅜″. Heavy duty jointers are available in 12″ and 16″ sizes. Tables are 8′ long; rabbet depth ⅝″. They use a round three or four knife, safety type cylinder head, and a three horsepower, 3600 R.P.M. T.E.F.C. motor; five H.P. motors and belt drive machines also available.

**WRITE TODAY FOR LITERATURE AND PRICES**

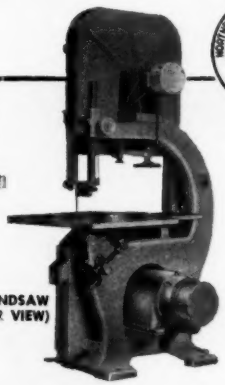


20″ BANDSAW

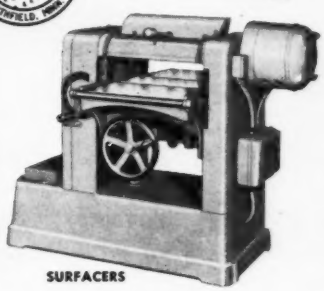
## *Northfield*

**FOUNDRY & MACHINE CO.**
**NORTHFIELD | MINNESOTA**

SHAPER



36″ BANDSAW (REAR VIEW)



SURFACERS

## Northfield BAND SAWS

are available in 20″, 27″, 32″ and 36″ sizes. The 20″ band saw takes 24″ x 36″ in floor space, horizontal capacity is 20″, vertical capacity under guide is 11″.

**Manufacturers of High Speed Precision Heavy Duty Woodworking Equipment**

## Northfield SURFACERS

are ideal for school shops. They have simplified, high performance, trouble-free, mechanical design. They are available in 18″ x 8″ and 24″ x 6″ sizes.